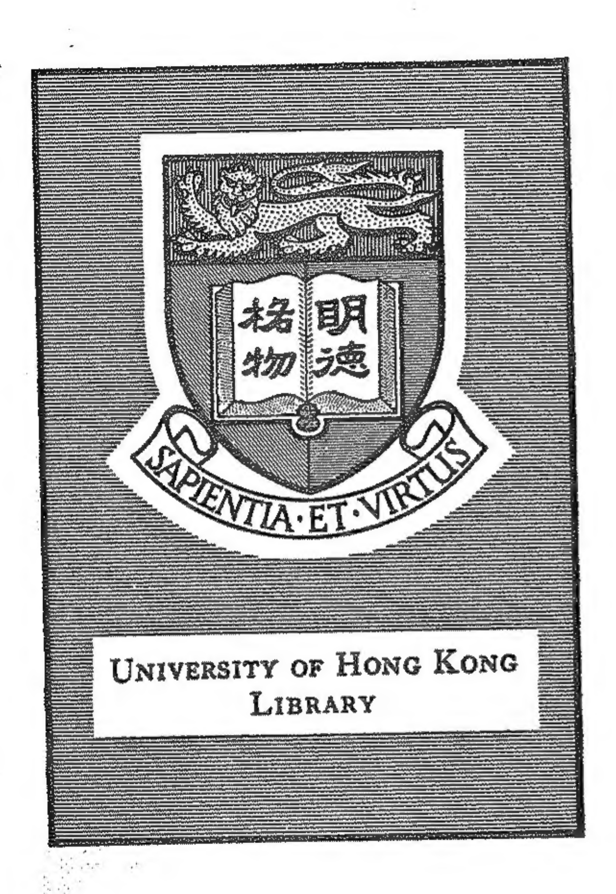


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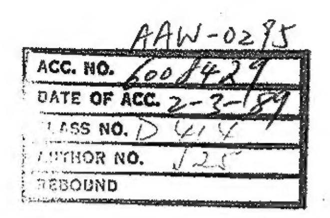
CHILD LANGUAGE APHASIA AND PHONOLOGICAL UNIVERSALS

by

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Til min venn Alf

PREFACE

It is now a quarter of a century since the first appearance of Roman Jakobson's *Kindersprache*, probably the most characteristic of his writings on phonology. My impression is that it has never been as well known as it ought to be in this country, and that it is not as well understood as it should be, either. Whatever the reasons for this might be, if in fact it is the case, an English translation is obviously the best remedy. There are, in addition, however, other reasons which warrant a translation.

I mentioned that the *Kindersprache* is perhaps the most representative of Jakobson's phonological writings. It is certainly the most comprehensive, as it is his fullest and most detailed discussion not only of phonological typology, but of the related problems of language acquisition and phonemic regression. And although most of the problems in these areas have been discussed in English versions by Jakobson, this is the only work to integrate them so fully within the same volume. One should remember that comprehensiveness is in many ways the essence of Jakobson's investigations, which provide explanations for a wide variety of facts that would otherwise remain disparate and only accidentally related.

Finally, the importance and influence of such a classic work as the *Kindersprache* are significant, and in fact, have grown rather than diminished in recent years, at least for a great many researchers in linguistics, psychology and language pathology. The reason for this, I think, is that one finds for the first time, in the *Kindersprache*, a formal linking of the problems of linguistic universals and of language acquisition, i.e., the view that any explanation of the latter is to be found in the innate character of the former. The interrelating of these problems has become, of course, one of the

crucial tasks of recent inquiries into the relation of linguistic structure to language acquisition, so that many of the questions so important to Jakobson, and treated in his 1941 monograph, have in a sense re-emerged again as focal problems in current thinking. To some degree, therefore, Jakobson's monograph can be considered as one of the first really insightful contributions to problems that have now become among the most important and stimulating ones in linguistic research.

I am indebted to Roman Jakobson for generously giving his time for discussion of the translation and to Professors Herbert A. Youtie and Gerda Seligson, who read the entire manuscript and made considerable criticisms and corrections, as well as Nancy Dorian, Anne G. Miller and Shirley Barlow for their invaluable help.

A. R. Keiler

Seattle, Washington
March, 1967

CONTENTS

What is truly unifying are the relationships of foundation.

HUSSERL

There is no difference in principle in the phonetic systems of the world, although there are, naturally, many phonemes with relatively limited distribution.

ALF SOMMERFELT (1928)

I

THE PHONOLOGICAL DEVELOPMENT OF CHILD LANGUAGE AND APHASIA AS A LINGUISTIC PROBLEM

1. TYPES OF LINGUISTIC ACTIVITY

"The child provides the only opportunity that we have to observe language in its nascent state", as Karl Bühler has recently written,[1] and one could continue accordingly: Pathological speech disturbances of a central nature provide the only opportunity that we have to observe language in dissolution. For the linguist, who is concerned with the fully developed structure of language, its acquisition and dissolution cannot fail to provide much that is instructive. These three aspects of language have not yet undergone a systematic comparative analysis.

2. INTERACTION BETWEEN CHILD LANGUAGE AND THE LANGUAGES OF THE WORLD

The gains of previous research are not to be underestimated, whether in the field of child language in general, or its phonological problems in particular, to which we confine ourselves here. Certainly, several striking points of contact have been observed between the linguistic development of the child on the one hand, and the languages of the world on the other. In particular, the interrelation between these two areas has been discussed. Romanticism stressed the creativity of the child, while the approach of scholars like Wundt or Meringer, considered realistic by its proponents, sought to explain the intellectual, and especially the linguistic, activity of the child as mere imitation. There is some truth in both points of view. On the one hand, the creativity of the

[1] *Arch. f. d. ges. Psychol.*, XCIV (1935), 410.

child is obviously not pure creativity, or invention out of nothingness; on the other hand, however, neither is his imitation a mechanical and involuntary adoption. The child creates as he borrows. The objection to any conception which denies any autonomous value to an adoption of a cultural creation of the high society by lower strata (called "gesunkenes Kulturgut") is just as valid for the child's acquisition of language: his borrowing is not a strict copying; every imitation requires a selection and consequently a creative departure from the prototype. Certain constituents of the model are eliminated, while others are revalued. In spite of its dependence on that of the adult, therefore, the phonological system of the child may contain elements which remain completely foreign to his model.

Thus children who do not yet possess any *r*-sound often pronounce the sequence "vowel + *r* of the same syllable" as a lengthening of the vowel (*e.g.*, Russian *marka* "mark" as *māka*), and temporarily create in this way a quantitative opposition which is otherwise completely unknown to Russian.[2] The French consonantal pattern is a pronounced triangular system with three voiceless, voiced, and nasal stops, and in addition three voiceless as well as voiced fricatives: namely, a labial, dental, and palato-velar sound in each series. But children who have not yet acquired any fricative sound frequently split the palato-velar series into a velar and a palatal, by developing in addition to *k*, a (sometimes more or less affricated) palatal stop from the French *ʃ* (or *ʃ* and *s*), and in this way temporarily present a quadrangular consonantal system (cf. § 25f.).[3] So long as stops in child language are not split according to the behavior of the glottis, they are generally pronounced as voiceless and unaspirated. The child thus generalizes this articulation independently of whether the particular prototype opposes the voiceless unaspirated stop to a voiced unaspirated stop (as in the Slavic and Romance languages), or to a voiceless aspirated stop (as in Danish). The same characteristic articulation occurs in child language for a limited time even when the mother tongue contains a marked opposition, voiced unaspirated ~ voiceless aspirated, and therefore no voiceless unaspirated stop. This has been observed in Norwegian children by Sommerfelt (γ 213) and

[2] Grégoire records a similar compensatory lengthening for French children: *tātan* "tartine", *pā* "poire", *tɛ̃* "terre", *ɔ̃* "dehors", etc. (β 172, 212f.).
[3] See, *e.g.*, Bloch 44ff. A similar change of *s* to the palatal stop is found also among the languages of the world. C. Meinhof, *e.g.*, records it for the Tagoy languages of Egyptian Sudan (*Zeitschr. f. Kolonialspr*. VI (1915-1916), 165).

confirmed by Professor Knut Knutsson from his observations of Swedish children.[4]

Occasionally a kind of sound change occurs in child language. Thus, according to Alexandrov's observations of a two-year-old Russian boy, *k* was replaced by *t*, but *g* regularly by *k* (cf. *e.g.*, *jút'i* "rúki", *n'ik'i* "knigi", *akán'* "ogon'"). Presumably, he first substituted *t* for *g* as well as for *k*. When he had acquired the *k*-sound he used it to reproduce only the velar stop that was most opposed to the *t* in the language of his environment, *i.e.*, the voiced velar stop, while he continued to replace the voiceless velar stop with *t*. The same child dropped *j* in imitated words (*e.g.* *ákəd'i* "jagody", *áb'ət'ka* "jabločko"), and at the same time replaced the more conspicuous liquids of the prototype by *j* (*jámpə* "lampa", *jás'kə* "ložka", *juká* "ruka"). In a completely analogous manner an English girl, as Sully reports, "no matter how capricious it might appear, occasionally avoided the use of the *yod*, so that she said *esh* for *yes*. She used the same sound regularly as a substitute for *l*, however, and therefore said *yook* for *look*, etc." (130).

The young speaker modifies his linguistic model, and frequently perseveres obstinately in these deviations and resists every attempt at correction. The separatist attitude, which is well known on various levels of linguistic activity and is fraught with serious consequences, manifests itself in the child as well and leads him occasionally to a kind of separate language. The best-known example of this is Stumpf's description of the "frozen" beginning stages in the speech of his son, who still consciously refused at the age of three years to adapt to his linguistic surroundings. Close communication between two or more children and their relative isolation from any adult occasionally results in the prolonged maintenance of a beginning phase of language. There is, for example, the interesting case described by Saareste of three brothers and sisters on an isolated Estonian farm who, from the ages of eight to twelve, still retained the "frozen" speech of their early childhood. Sometimes this frozen brother-sister language remains as a special or secret language, while the same children otherwise speak the customary language fluently (cf. Vinogradov). The

[4] Bolin (162) and Gutzmann (α 20) incorrectly identify this sound with the voiced stop. Cf. the appearance of unaspirated voiceless stops in German aphasics (Ketterer 710).

adherence to linguistic distortions is not peculiar to backward children. Indeed, we often meet the same trait in the childhood of important writers. The brothers Karel and Josef Čapek, two outstanding representatives of Czech literature, conversed readily with each other in this kind of special language until puberty, as the latter relates in his memoirs.

Accordingly, we recognize in the child's acquisition of language the same two mutually opposed but simultaneous driving forces that control every linguistic event, which the great Genevan scholar characterizes as the "particularist spirit", on the one hand, and the "unifying force", on the other.[5] The effects of the separatist spirit and the unifying force can vary in different proportion, but the two factors are always present. Even the young Stumpf, mentioned above, who actively resisted the language of his environment, fully possessed it passively. The unifying force not only affects the language of the child directed to the adult, but also affects the language of the adult directed to the child, indeed, even the speech of one adult to another in the presence of children. In the latter case also, various stages of this adaptation can be observed. Thus one talks in child-fashion to the child, and attempts to imitate the phonological, grammatical, and lexical peculiarities of his speech, or at least avoids some of those linguistic resources which are especially inaccessible to the child. We even have at our disposal for this purpose a traditional mixed language adapted to the linguistic ability of the child, which is known by the term "nursery language". In short, the child is an imitator who himself is imitated.

The effort to make what is said accessible to the child is the original function of the adult's borrowing, but this function can easily be extended, since the same borrowings can be generalized in the language of the adult. Thus we find, as E. Oehl in particular has made clear by numerous examples, a considerable number of babbling words in the vocabulary of all languages taken over from the "nursery language". It has been established repeatedly that a

[5] F. de Saussure, *Cours de Linguistique* (Paris, 1922), 218ff.; cf. my article in *Actes du IV. Congrès Intern. de Linguistes* (Copenhagen, 1938), 48ff.

child in full control of his language can suddenly take pleasure in reverting to the role of a baby and, either by imitating the language of a younger brother or sister, or to some extent through his own recollection, attempt once more to talk like one. To a different degree, the infantile instinct may also appear in adult life, as psychoanalysis in particular has stressed. And Gabelentz has pointed out that courting lovers quite frequently talk in child language, and he is of the opinion that it is a matter of convention whether this practice is limited to the intimate hours in private, or whether it ventures into public.[6] A certain style of speech in general, or a given group dialect (*e.g.*, female language), can acquire infantile characteristics. Fashion can, then, extend the use of such features and spread them throughout the whole language.

When we observe, *e.g.*, in the coquettish, precious, love language of Russian peasantwomen in Northeast Siberia (near Lower Kolyma), a *j* in place of a liquid, this so-called "sweet-talk" (*sladkojazyčije*) is a deliberate infantilism similar to the change or *r* to *j* in the speech of the two-year-old son of Grammont, who took over this manner of pronunciation from his younger sister and generalized it throughout his whole vocabulary (79). But the acceptance of this "sweet-talk", and its tendency toward diffusion in the Russian dialect of the area mentioned above, is no longer to be explained by the presence of an infantile inclination, but simply by the influence on the peripheral dialect of that extensive association of languages which includes the majority of languages bordering the Pacific Ocean, and whose phonemic system, as is well known, is characterised by the possession of, at most, a single liquid. This isogloss includes, besides Chinese, Japanese, Korean, Ainu, Aleut, several Northwestern American languages, and several Indonesian languages, as well as most of the Paleo-Siberian languages. The Koryak and Chukchee dialects, however, as well as the Russian (or more exactly, only the Russian female language) spoken in Kolyma, the territory lodged within the Chukchee area, have no liquid phoneme whatsoever.[7] The adaptation to child language

[6] *Die Sprachwissenschaft* (Leipz., 1901²), 277f.

[7] See *e.g.* A. Seliščev, *Dialektologičeskij očerk* (Irkutsk, 1921), 45f., for data on the change of *r* and *l* to *j* in the Russian dialect of Lower Kolyma and on the similar sound change of the Russian inhabitants in Jenissej (in this case especially of the women). The absence of *r* in these Russian dialects is extended to include the complete loss of the liquids in imitation of the Paleo-Siberian and Samoyed languages of Jenissey, in which the absence of *r* is a characteristic feature. Cf. N. Karger, "Ketskij jazyk", *Jazyki i pis'mennos' narodov Severa*

in this case is a means of phonological change, not the motivation for it.

The phonological changes in language which arise from children are realized either by the adaptation of the older generation to the language of the child, or by the permanent reluctance of children, *i.e.*, the new generation, to accept a certain component of their linguistic inheritance. Such sound changes from one generation to the next have been discussed and emphasized more than once in the linguistic literature.[8] But even in this case the encroachment of child language is only one mode of phonological change, not its real cause. The question inevitably arises: Why is one component of the linguistic system uncompromisingly and irrevocably rejected by the new generation, and why is it the same component for all of its members? The answer obviously lies outside the specific problem of child language. Such a change is predetermined by the internal, inherent development of the linguistic system; it is not an alien modification forced upon the linguistic system by children. Rather they anticipate those changes which are internally predetermined — in the air, so to speak. Just as the source of contagion for an organism is less significant than its susceptibility to the contagion in question, so it is in the history of language: The child's manner of speaking can indeed be the source or the means of a linguistic change, but it is the readiness of the linguistic system for the mutation in question that is decisive for it.

3. OCCASIONAL AND CONSTANT AGREEMENTS

Linguistics has thus shown that changes in language can sometimes originate with mutations of child language. On the other hand, research has also established that nearly all of the mutilations of ordinary language observed in children have close parallels with the sound changes of different languages of the world. As Maurice Grammont has stated, "By collecting the linguistic peculiarities of

(Leningrad, III, 1934), 226f., and G. Prokof'ev, "Eneckij (enisejsko-samoedskij) dialekt" (*ibid.*, I, 1937), 77.

[8] Cf. the critical survey in Delacroix α 179ff. and Jespersen β 142ff.

a very large number of children, one could construct a kind of grammar of changes which have appeared and can appear somewhere in language" (61, cf. also Stein γ). But in addition to all of these occasionally possible similarities, there are necessary and constant parallels between child language and the historical development of the languages of the world, and it is precisely this fundamental problem which so far has hardly been considered. It is not difficult to specify the reason for this gap.

4. RECORDING AND ANALYSIS OF THE BEGINNINGS OF CHILD LANGUAGE

The establishment of these general and necessary parallels presupposes the study of the structural laws of linguistic systems — a task much neglected until a short time ago. In addition, the uncovering of generally valid structural principles of child language requires very careful and exact observations concerning the actual linguistic development of the child. In particular, the pre-language stages of the child as well as the initial stages of his linguistic development, which are of the utmost importance for the phonological structure of language, have been neglected for a considerable time. We are indebted, to be sure, to many persevering psychologists and pedologists for detailed monographs on infancy and the development of language during this period; but the indispensable knowledge of linguistics, and especially of phonetics, is, unfortunately, usually lacking in these writers, and consequently the value of their statements for the linguist is fundamentally impaired.[9] To be sure, we also possess numerous and exact observations on child language which come from distinguished linguistic scholars, but for the most part they are far too fragmentary and defective, and they are particularly unsystematic for the beginning stages of child language. Thus, *e.g.*, even one of the best specialists in child language, the French linguist Oscar Bloch, states, "I have only slightly observed the speech of the first year and first months of the second year, or rather I have recorded little. Not only is it difficult indeed to grasp

[9] Cf. also Sommerfelt γ 273.

and to record the sounds that are produced, but to interpret them also entails large demands" (694).

The Belgian linguist Antoine Grégoire deserves the credit for having accomplished this difficult task. In his rigorously systematic, microscopically exact, and voluminous examination *L'apprentissage du language*, he has set for himself and carried out the exhausting task "of having lived day by day, hour by hour, in the society of infants, and of having observed every instant the external manifestations of their activity" (β 5). He attempted in this way to achieve the greatest possible exactness and completeness, both in the phonological transcription of the linguistic utterances that are so difficult to grasp, and in the establishment of their restrictions and functions. The work of Grégoire shows step by step the emergence of the linguistic structure, and much that remained unclear in the happy jumble of the older literature becomes consequently comprehensible and easy to follow. By this work the classification and full exploitation of the earlier abundant but extremely fragmentary data are also made possible.

The structural analysis of language acquisition must henceforth be carried out. It is necessary to trace its general laws, or if one prefers a less exacting term, laws that strive toward general validity. This programmatic demand was in fact clearly raised by Grammont in the above-cited work at the beginning of this century. There is in the child, according to this clear-sighted scholar, "neither incoherence nor effects of chance. ... He undoubtedly misses the goal, but he deviates from it always in the same way. ... It is this constancy of deviation which gives importance to his language and at the same time permits one to understand clearly the nature of the modification" (62).

5. PRINCIPLE OF LEAST EFFORT AND CESSATION OF BABBLING SOUNDS

The fact that a fixed order must be inherent in language acquisition, and in phonological acquisition in particular, has repeatedly been noticed by observers and has often been explained by appealing to

the principle of least effort. First mentioned in Buffon, this principle is nonetheless generally cited as Schultze's law of the succession of phonological development, since it was Fritz Schultze who, fifty years ago, energetically sought to prove that those speech sounds which require the least physiological effort for their production are learned first by children (27). This questionable hypothesis was indeed often opposed, particularly because of the quite arbitrary nature of the criteria for determining the degree of effort required for the sounds in question.[10] Nevertheless, a remnant of such a conception is still continually found even in the newer works on child language, *e.g.*, in the famous handbook by Stern.[11] But this hypothesis is completely refuted by an essential fact of the child's linguistic development.

The actual beginning stages of language, as is known, are preceded by the so-called babbling period, which brings to light in many children an astonishing quantity and diversity of sound productions. A child, during his babbling period, can accumulate articulations which are never found within a single language or even a group of languages — consonants of any place of articulation, palatalized and rounded consonants, sibilants, affricates, clicks, complex vowels, diphthongs, etc. According to the findings of phonetically trained observers and to the summarizing statement of Grégoire (β 101), the child at the height of his babbling period "is capable of producing all conceivable sounds".

As all observers acknowledge with great surprise, the child then loses nearly all of his ability to produce sounds in passing over from the pre-language stage to the first acquisition of words, *i.e.*, to the first genuine stage of language. It is easy to understand that those articulations which are lacking in the language of the child's

[10] Thus the predominance of labial sounds in children is explained in two different ways. Schultze suggests that there is some special articulatory facility associated with these sounds, while Röttger suggests, on the contrary, that "the motor movements of speech are considerably more extensive and require more energy in labial articulation", and therefore take on an "increased importance" psychologically (79).

[11] "The difficult palato-velar sounds are replaced by the easier dental sounds" (337, cf. 333).

environment easily disappear from his inventory. But it is striking that, in addition, many other sounds which are common both to the child's babbling and to the adult language of his environment are in the same way disposed of, in spite of this environmental model that he depends on. Indeed, the child is generally successful in recovering these sounds only after long effort, sometimes only after several years. This is the case, *e.g.*, with palatal consonants, sibilants and liquids. Inasmuch as the child continually repeats these sounds during the babbling period, their motor image is necessarily imprinted on him, and the acoustic image must also exist. The observation of deaf and dumb children shows clearly that for normal development the acoustic impression of one's own sound productions is all-important, and that the child reacts to just this perceptual impression when he attempts to imitate his own sound productions in the process known as autoecholalia.[12]

It has been supposed that acoustic impressions, insofar as they are not supported physiologically, are at first only accessible to the child with great difficulty, so that in the beginning he is aware of only a small number of the sounds that he hears.[13] But experience proves the opposite. The one-year-old son of the Serbian linguist Pavlović recognized and distinguished faultlessly the words *tata* and *kaka* when spoken to him, but consistently said *tata* instead of *kaka*, even though he easily produced the velar stops in his babbling "concerts" (39). There are two varieties of language for the child, one might almost say two styles — one he controls actively, the other, the language of the adult, only passively (cf. the distinction of male and female language in many tribes: every one speaks only one but understands the other). For a time the child cannot, or sometimes will not, cross over this boundary and in fact demands that the adult also adhere to it. According to the well-known description by Passy, a young French girl said *tosson* for both *garçon* and *cochon*, but she protested when someone near her called a boy a *cochon*, or a pig a *garçon*.[14] This example is, in principle,

[12] See *e.g.* Feyeux 125, Baldrian 496.
[13] Thus *e.g.* Merringer 211.
[14] *Études sur les changements phonétiques et leurs caractères généraux* (Paris,

similar to that of older children who still babble, but who become angry when an adult also begins to use baby talk for their benefit. "Mais maman! Parle-moi français." (Vuillemay 124), or "Kan tanten inte tala rent?" (Sjöholm 189) are typical of their amusing responses.

Babbling, on the one hand, and the so-called "Hörstummheit" (comprehension without speech) of the child, on the other, prove that he is deficient neither in motor nor in acoustic impressions, but nevertheless most of his sounds are suddenly lost. It has been supposed that there exists in the child no useful connection between those sounds spoken by someone else and his own articulatory sensations,[15] but this assumption is also contradicted by observation. First, one often secures the "parrot-like" repetition of single sounds and syllables from children, even though the very same sounds continue to be absent when they talk spontaneously.[16] Second, these sounds are sometimes used correctly in the first acquisition of words, but with the familiarization of these words, and with the progressive acquisition of vocabulary, they disappear from use without a trace. One can, for example, cite the niece of the child psychologist Ament: in the first words which she acquired, she still endeavored to differentiate the sounds *t* and *k*, but she soon gave up this distinction and generalized the use of *t* (51 ff.).

1891), 22. Cf. Jespersen, β 88f., van Ginneken 50f. While it is true that the child distinguishes perceptually more sounds than he uses in the first stages of language, he also fails to hear many phonological oppositions of his native language, although the same sounds appeared in his babbling period. Thus, *e.g.*, the older son of Grégoire, in his seventeenth month cannot yet pronounce the word "bateau". He is nevertheless able to recognize it, but he does not yet perceive the opposition of oral and nasal vowels. When one says "baton" to him, he believes he hears "bateau" and imitates a siren (β 136), although he could nasalize vowels in his babbling period (63). This is frequently also the case in the babbling period of German children (see *e.g.*, Stein γ 102). Cf. the child of Bloch, who does not distinguish the words *moment* and *maman*, *poussière* and *pisser*, *passé* and *cassé* when they are spoken to him (α 52).
[15] Bühler β 217.
[16] See *e.g.* Abrahamsen; cf. similar experiences in speech disturbances: "Even when one has taught an aphasic with considerable trouble and effort to repeat a word, *e.g.*, the word *Stuhl*, he is still not able to say *Stuhl* spontaneously" (Gutzmann δ 175).

6. EMERGENCE OF THE SPEECH SOUND

The selection of sounds in the transition from babbling to language can be accounted for solely by this transition itself, *i.e.*, by the newly acquired function of the sound as a speech sound, or, more accurately, by the phonemic value which it comes to have.[17] Alongside the purposeless egocentric soliloquy of the child, and gradually replacing this biologically oriented "tongue delirium" (to use Preyer's term) there arises and grows by degrees in children a desire for communication. We witness the first expressions of his social life: the child seeks to respond to and adapt himself to the person to whom he is speaking in every way, even in changes of volume.[18] The little beginner learns to recognize the identity of the sound phenomenon which he produces, hears produced, remembers, and reproduces, first directly and only afterwards indirectly (metalalically).[19] The child distinguishes it from other phonological phenomena which he has heard, retained, and repeated, and this distinction, which is felt as an intersubjective and constant value, strives toward a meaning.[20] To the desire to communicate is added the ability to communicate something. The dummy dialogue becomes a true dialogue, and as soon as sound utterances "are employed for the purpose of designation" the actual stage of

[17] This process of phonemic acquisition is exactly observed and recorded in Grégoire's book; cf. also Delacroix β and K. von Ettmayer, who correctly observes that it is not a question here of the ability or inability to articulate certain sounds, but of the mastering and retaining "of the system of phonemic oppositions" (*Berl. Beiträge z. Rom. Philol.*, VIII: 1, 1938, 36).

[18] As van Ginneken (10) observes, there is a striving, beginning with the first stages of language, to react to whispering with whispering, and to the raising or lowering of the voice with a similar raising or lowering. Cf. Grégoire 73f. and Ch. Bühler-Hetzer.

[19] Cf. Lewis 95ff., Stern 135.

[20] Certain sound formations function at this stage as "antecedent signs" — "word embryos", as Grégoire correctly terms them (β 94, 125). "The words in question are already more than simple sounds. They appear under certain conditions, they are related to specific situations, and in this way have a latent meaning, still badly defined and too vague. New factors will eventually delimit them as they act on the attention of the child and are then retained in his memory" (*ibid.* 86).

language formation is launched, as Wundt correctly realized (283).

It is precesely these arbitrary sound distinctions aimed at meaning which require simple, clear and stable phonological oppositions, and they must be capable of becoming impressed on the memory, and of being recognized and reproduced at will. The original self-sufficiency of the many disunited, individual perceptions is replaced by a conceptual distribution of articulated sounds, parallel to that of colors.[21] In place of the phonetic abundance of babbling, the phonemic poverty of the first linguistic stages appears, a kind of deflation which transforms the so-called "wild sounds" of the babbling period into entities of linguistic value.

7. INTERJECTIONAL SOUNDS

The close connection between the selection of phonemes on the one hand and (following de Saussure) the arbitrary, unmotivated character of the linguistic sign on the other is confirmed by the fact that exclamations and onomatopoetic formations (sound imitations) take almost no account of this selection. Indeed, sound gestures, which tend to form a layer apart even in the language of the adult,[22] appear to seek out those sounds which are inadmissible

[21] Cf. L. Weisberger, *Muttersprache und Geistesbildung* (Göttingen, 1929), 27.

[22] Thus, *e.g.*, so far as we know, the intermittent labial liquid does not function in any language of the world as an autonomous phoneme, but is very frequently used in sound gestures (cf. P. Ariste, *The Labial Vibrant in Estonian*, Tartu, 1935), and in this function arises even in early childhood. The eleven-month-old boy of Hoyer produces it while pulling at a strap (381), as does Edmond Grégoire at the same age, "while the child passes his hand over his face from top to bottom ... as part of a game ... which he repeats from time to time" (97). In Greek children this liquid was observed as an onomatopoetic designation for water (Diamantaras 69), and the same consonant survives persistently as "the sound of shivering" in aphasics (Kleist β 138). Also, the distinction between a simple labial stop and a click of the same place of articulation ʘ never has any phonemic value: the voiceless labial stop phoneme is represented in Bushman as a labial click (more exactly — as the combination of a labial click and a glide sound *p* — cf. P. Meriggi in *Zeitschr. f. Eingebor.-Spr.*, XIX, 127 f.) and in other languages of the world as the more common labial stop. *p* occurs in Bushman, on the contrary, in sound gestures — "exclamations, and imitations of sounds" — (see D. F. Bleek, *ibid.* 82) and the labial click occurs in sound

in a given language. Thus in children who do not yet have any velar phonemes, one observes *gi* as an imitation of falling blinds, *kra kra* of the raven's cawing, *gaga* as an indication of pleasure, *ch-ch* as a sound of joy, *kha* = "pfui", etc.[23] Although fricatives are still replaced by stops in the "objective denoting language" of the child, the former can appear as sound imitations with onomatopoetic function. The noise of a trolley car is reproduced by *zin-zi*; the cat, by one child, and the fly, by another, is imitated by *ss*;[24] and there are frequent attempts to imitate the sound of an airplane or to chase away chickens or dogs with *f*.[25] The liquid *r* can still be lacking in words which the child borrows from an adult, but the sound of a bird or of rattling can nonetheless be reproduced by it,[26] and children who do not yet make use of any *i* imitate the barking of dogs with *didi* or the cry of the sparrow with *titi*, *bibibi*, and *pipi*.[27]

Whether it is a question of spontaneous or of conventional sound gestures, of original formations or of adaptations, sound gestures, by their very nature, require a greater awareness of their sound pattern.

It is thus the expressive value of the extraordinary rather than the desire for faithful sound imitation which causes children to use rounded palatal vowels in their onomatopoetic words, while they continue to replace them in their remaining vocabulary with unrounded or velar vowels. For example, a young German boy of eleven months, mentioned by Stern (381), reproduced the sound of moving vehicles and horses by *ööö*, and the nineteen-month-old Edmond Grégoire used the same sounds to reproduce the sound of bells (β 153). The same vowels served the fifteen-month-old daughter of Marcel Cohen as an imitation of the barking of dogs

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gestures in the remaining languages of the world. This sound is already found as an onomatopoetic "kissing sound" (Stern 374) in children at the end of their first year.

[23] See van Ginneken 7, Bolin 161, Stern 173f., 176.

[24] See Pavlović 70, Mandell-Sonneck 489, Scupin 52.

[25] See Pavlović 35, Grégoire β 89f.

[26] Rasmussen 76, Stern 374.

[27] See Brenstiern-Pfanhauser 290, Grégoire β 111, 217.

(114). This onomatopoetic usage was transformed into a simple designation of the dog — *oo* — and it is noteworthy that the vowel sound was then adapted to the ordinary phonemic system of the child (117). The reverse phenomenon, however, can also be observed. The original onomatopoetic word becomes a simple and conventional designation without undergoing any change in sound, and the phonemic system is thereby enriched. Or, finally, an onomatopoetic sound can, so to speak, prepare and facilitate the emergence of the corresponding phoneme, although this incidental vocal gesture need not become part of the child's vocabulary. This advance is induced artificially by the linguistic training of children who have not yet acquired the sounds of their language. The child is easily taught to pronounce an *r*, *e.g.*, as an imitation of the noise of a motor, or an *s* in imitation of a whistle. He is then made aware of the identity of this sound imitation with the phoneme which he lacks (cf. Feyeux 279).

8. SUPPOSED EXCEPTIONS TO ORDER OF PHONOLOGICAL DEVELOPMENT

Sounds, as we have said, are subjected by the child to a selection by which they become speech sounds only insofar as they are related to language in the strict sense of the word, *i.e.*, to the "arbitrary linguistic signs", according to the Saussurean concept (*op. cit.*, 100f.). This selection is, therefore, inseparably linked to the sign nature of language, that is, is a purely linguistic matter: speech sounds are considered solely in terms of their sign function. The question of the prelanguage babbling period proves to be, on the contrary, one of external phonetics, predominantly articulatory in nature, and it is significant that there one cannot establish any general sequence of acquisitions. Thus, *e.g.*, one of the most exact observers of the phonological development of the child, Jeanne-Andrée Feyeux, writes concerning the appearance of babbling sounds: "All the testimonies are divergent with respect to the order of appearance" (126f.).

But once the first stage of actual language is reached, and the selection of speech sounds and the construction of a phonemic system is launched, we observe a succession which is universally valid and is strictly regulated by structural laws. The surprising uniformity in the phonological development of child language has continually been recognized anew by investigators from different disciplines and from different countries — *e.g.*, the above-mentioned French physician[28] and her countryman, the eminent phonetician P. Passy; the Japanese psychologist Yozikazu Ohwaki; the Belgian Antoine Grégoire, author of the best linguistic monograph on the language of the earliest stage of the child's development; the German linguist Meringer; and the Viennese Löbisch, one of the first observers of child development.

Again and again a number of constant features in the succession of acquired phonemes are observed, and again and again doubts are raised in the technical literature against the assumption of a regular order of development, so that the inquiry into its laws is in the meantime suspended. But all of these objections rest on the insufficient delimitation of the relevant components of language from pre-linguistic, external, or linguistically irrelevant elements. Thus, *e.g.*, Schultze's correct observation that *ø* and *y* in child language belong to the latest phonological acquisitions is neither contradicted nor weakened by Preyer's reference to the very early, prelanguage appearance of rounded palatal vowels during the babbling period (367f.), since the appearance of phonemes in a linguistic system has nothing in common with the ephemeral sound productions of the babbling period, which are destined to disappear. In the language of the older son of Grégoire, the phonemes *ø* and *y* were lacking until the end of his second year, whereas he produced spontaneously babbling sounds of a similar articulation in the middle of his first year. In Czech infants the vowels in question appear from time to time as babbling sounds, although they are completely foreign to Czech and are extraordinarily difficult for Czechs who are learning French.

[28] "Several invariables seem to emerge, which are found without major modifications in almost all children" (Feyeux 162).

As Meumann has already stated (α 23), a short period may sometimes intervene between the stage of spontaneous babbling and that of true language development, in which children are completely mute. For the most part, however, one stage merges unobtrusively into the other, so that the acquisition of vocabulary and the disappearance of the prelanguage inventory occur concurrently.[29] First of all, then, the "permanent" speech sounds, as Gutzmann calls them (α 17), are to be carefully distinguished from the disappearing babbling sounds — the child's embryo-words from the prelanguage residue. The persistence of the sound, the intention to express meaning by the formation in which it occurs, and the social setting of the utterance are fundamental criteria for distinguishing speech sounds from babbling sounds. As the child develops, the social factor becomes daily more important, while babbling is restricted to the leisure of solitary play and of waking and of going to sleep (cf. Grégoire β 138), and is later relegated to dreams.

Secondly, as we have already pointed out, as far as the phonemic inventory is concerned, language in the narrow sense of the word (*i.e.*, language as a system of arbitrary signs) must not be confused with sound gestures whose phonological form is motivated.

Finally, one must rigorously separate what is significant from what is irrelevant to the distinction of words. Some pairs of sounds that are used to distinguish the meanings of words (and hence are phonemic distinctions) are for the child initially variants of the same phoneme, regardless of the considerable range of variation. The choice between these variants may be determined by the adjoining sounds. I have observed, *e.g.*, that *i* and *u* represent for a one-year-old Czech girl a single high vowel phoneme, and similarly *e* and *o* a single mid vowel phoneme; *i* and *e* occurred only after dentals, *u* and *o* only after labials, while before *a* labials as well as dentals occurred. Or the two sounds may be free variants which can appear in place of each other. Thus, before the emergence of an autonomous phonemic series of dentals, the single oral phoneme is commonly realized as a labial stop, but it can occasionally be replaced without change in function by an adjacently

[29] Cf. Ronjat 41, Cohen 110.

articulated sound, namely by a dental stop; and similarly *m*, the basic variant of the single nasal phoneme, by *n*.[30] After the splitting of the consonants into two series of phonemes — labials and non-labials — the latter are normally realized as dentals, which the child occasionally replaces with palatals. Often even *i* and *e* function initially as free variants of one and the same "narrow" phoneme, the first variant being stronger and more distinct, more distant from the "wide" *a* phoneme, and the other being weaker and less distinct.[31] Fricatives are in the beginning simply an inexact, imperfect and sketchy pronunciation of that stop in contrast with the vowel *a* (see below § 23). Thus, by a weakening or dissimilation, a labial fricative can appear as a substitute for the corresponding stop in the repetition of syllables.[32]

The word-differentiating or phonemic opposition of fricative and stop consonants is a comparatively late acquisition in child language. An observer who records all of the possible sound productions of the child, without considering any difference of function, can argue that, more or less simultaneously with the first words, single meaningless babbling syllables containing fricatives, such as *f*, can still be heard occasionally in the child's speech, only to disappear shortly thereafter; or he can argue that this sound was used by the child for imitations and for chasing chickens or dogs; or finally, that instead of the more usual *papa*, *pafa* was occasionally pronounced. If all of the sound productions of the child are tossed into the same heap, it is understandable that the laws of development cannot be disclosed. By careful delimitation, however, the regular succession of acquired phonemic oppositions clearly emerges.

[30] "In all probability, *t* and *d* must be considered, in the first stages, only as articulatory modifications of the labials, for which they are sometimes substituted, since the child seems to react to both sounds in the same way. They are variants in the same way that the nasal consonant *n* occurs as the synonym of *m*, if one may use this term, *i.e.*, as a modification which duplicates the prototype. ... The nasal consonant *n* ... is still confused with the other nasal and can sometimes substitute for it. It is here a question of noticing in the beginning the child's inability to distinguish between phonemes which possess a certain degree of similarity: the nasalization of *m* and *n* makes them similar at the same time that it differentiates them strongly from those phonemes which have the same oral articulation: *m* will not be confused with *p* or *b*, any more than *n* will be confused with *t* or *d*" (Grégoire β 61, 71, cf. Stern 353).

[31] "But these are only weakenings to which children do not attribute the value of a particular vowel. ... The nuances of vocabulary do not yet force children to disassociate the two vowels" (Grégoire β 70, 129).

[32] Cf. Grégoire β 66f., 97.

9. DISSOLUTION OF THE PHONOLOGICAL SYSTEM

The same considerations are valid *mutatis mutandis* for aphasic speech disturbances.

There are unfortunately only very few linguistically useful descriptions of aphasia, and these are based on only a small number of languages. The observations of linguists on infancy are for the most part all too superficial, but at least infants have been more often available to linguists than aphasics. We are indebted to psychiatrists and neurologists for a number of stimulating and fruitful ideas on particular linguistic functions, and especially on inner speech; but in the description and analysis of concrete linguistic, and especially phonological, facts they exhibit with few exceptions an astonishing perplexity and lack of attentiveness. It is not to be denied that the detailed linguistic form of problematical disturbances is indispensable in determining their causes, just as a rigorous linguistic analysis is indispensable to their symptomatology. With complete justification Arnold Pick criticizes the poverty of the results that pathology has so far obtained in this respect, as well as the scantiness of the records and the usual "lack of word-by-word transcription of pathological speech forms" (α 50). This noted scholar, in fact, who endeavored to make extensive use of a linguistic point of view in aphasic theory, found it necessary, in a study that deals precisely with the phonological alterations of aphasic speech, to make the following apology: "Of course we were not able to indicate in the written reproduction of what was spoken those facts which would have required a phonetic transcription with which we are not familiar ..." (δ 230). Karl Kleist, in the newest and most thorough survey of aphasia, also points

out the seriousness of these deficiencies, concerning which he feels obliged to state: "The observations set forth in the literature regarding real linguistic deafness unfortunately very often do not provide any exact description of how much the patient was not able to grasp from linguistic impressions, or of how much he was still able to understand — in general, how he heard language." Most of the observations about "real linguistic dumbness" (sound-dumbness) are open to criticism for the same reasons.

The pathology of language makes a fundamental distinction between aphasic sound disturbances and the so-called arthritic lesions of the bulbar senso-motor apparatus (designated as dysarthria or anarthria according to their degree) and the direct mutilations of the articulatory organs (dyslalia, mechanical alalia), as well as the peripheral hearing defects. In aphasic sound disturbances neither the articulatory nor the auditory organs are themselves injured, nor is the bulbar apparatus, "on which sound formation depends"; rather, "something which we have learned — a possession of the memory — is lost".[33] But what then is the controlling factor of this mnemic possession? As was pointed out above, the important factor for children who are learning their language is not the ability to produce or to perceive a particular sound, but the distinctive linguistic value of the sounds in question. In the same way, the reduction in the ability to pronounce or to perceive sounds, therefore, is not essential to the unlearning of the aphasic; only the ability to distinguish functionally significant sounds is important. It is here that one finds the essential origin of aphasic disturbances of sound production and comprehension. In some cases the aphasic is occasionally able to produce the sounds in question and very often preserves them in sound gestures; but their distinctive (phonemic) value is lost in the "arbitrary linguistic signs". There develops in patients, then, on the one hand, sound coalescences and confusions, and on the other, an absolute non-recollection of these sounds — that is, the sound disappears without being replaced. In both cases a distinction ceases. For example, in the latter case,

[33] See Liepmann α 465, Kleist γ 928f.

with the loss of the Czech phoneme *r*, the distinction between *r* and *ø* is lost. In the former case, the distinction between *r* and *l* is lost, so that either *r* falls together with *l* (*hrad* "city" > *hlad*), or *r* and *l* function as free variants (*hrad* "city" as well as *hlad* 'hunger' can be pronounced by patients with either *r* or *l*).

The notorious difficulties which commonly arise in the comprehensive description of the so-called "true aphasias" (*aphasies pures ou extrinsèques*), or in the establishement and classification of their different forms and stages, as well as in the examination and testing of individual patients, disappear automatically when one attempts, first of all, to answer the following question: what changes does the phonemic system — the system of sound values that distinguish meanings — undergo in aphasics?

If this question is considered, then indeed the succession of changes turns out to be absolutely fixed, whereas arthritic disturbances can be limited to any particular speech muscle or any sepuence of sounds whatever (cf. § 8). Individual components of the phonemic system are eliminated in sound aphasia in a determined order of precedence.

As long as a part of the phonemic system continues to exist, it forms in its turn a system which is still ordered, although impoverished. And just as the child not only reduces his linguistic model but often attributes new values to the simplified system (cf. § 2), there is in the linguistic system of an aphasic as well not only a reduction of the former richer system, but sometimes also a remodeling. The curious change shown by the Czech aphasic examined by Pick (δ), who replaced the initial stress of the mother tongue with accentuation of the penultima, is to be connected with the simultaneous tendency toward the reduction of Czech vocalic quantitative oppositions. In the history of the West Slavic languages both phenomena — the loss of quantity and the transition from initial to penultimate stress — are more than once found linked together (Polish, some Czech and Slovak dialects). This connection has been explained by the fact that with the loss of quantity, the stress is naturally felt as more intense and that it is precisely the penultima in contrast to the initial syllable that gives greater prominence to the stress. The distinctions of stress are more emphatic in the rising-falling pattern of the word than in the simple falling, and more striking in the alternating stress of the next to the last and single syllable of the word than in the uniform initial

stress.[34] A constructive adjustment is even manifested, therefore, in the destruction of the aphasic's phonological system, and it recalls the "reparatory substitute-function" which was repeatedly observed in new formations of agrammatism.

10. SOUND AND MEANING DISTURBANCES

The newest developments in aphasic theory suggest that an inquiry into the phonemic character of sound disturbances may be necessary. The effort of modern psychiatry, which goes back to Broca's clearsighted formulations (see esp. 91), to consider all phenomena of linguistic activity from the point of view of "their symbolic character, or sign nature" (cf. Thiele 949), is more and more consistently being applied to impairments of the "inner means of language", and it must naturally be extended to the "external means", that is, to the phonological form of the language, and accordingly to phonological disturbances. This programmatic reminder has, moreover, already been incorporated into the comprehensive interpretations of language pathology, and it has been explicitly pointed out that the study of aphasia cannot altogether dispense with phonology inasmuch as functions that are a part of phonology are also involved in establishing meaning (Pick ε 1419). A progression from the sphere of sound to that of meaning ought to be apparent in every theory. Yet even some of the newest investigations of aphasia "obscure this clear and unequivocal position", and therefore fail to analyze the comprehension of speech sounds in more detail. Isserlin has characterized this, with justified harshness, as " a grave and fatal error" (208).

"An abstracting and referential comprehension of the permanent or relatively permanent reality of things" (*ibid.*, 220), which fundamentally distinguishes our speech activity from the non-referential acoustic-articulatory sensations of the babbling child, must be learned by the child in the acquisition of language. In true aphasia, on the other hand, this "imprinted fixation" (to use the term of the pathologists) of the mnemic phonological possession

[34] Cf. my *O češskom stiche* (Berlin, 1923), 51 and 41.

is lost.[35] Every attempt to restrict the speech sound to an external empiricism is unsuccessful, and another prominent scholar in modern speech pathology, K. Goldstein, teaches in agreement with contemporary linguistics that there is no distinction between sounds and words in this regard: "a sound is the same as a word ... either a motor act or a linguistic entity" (β 765).

Phonemes and words are related in different ways to the sign function of language. While every word — *i.e.*, every grammatical form — has its own particular and constant meaning, the phoneme performs only the function of distinguishing meanings without possessing any positive meaning of its own. It distinguishes every word in which it occurs from all other words which *ceteris paribus* contain some other phoneme.[36] Accordingly, the disturbances of meaning and of phoneme comprehension are certainly to be distinguished; but at the same time one must not forget that they are two easily associated although independent aspects of an essentially uniform aphasia, and the sign value of language possession is impaired and diminished in both cases. The fundamental participation of the phoneme in meaning, namely its distinguishing function, is clearly demonstrated in the disturbance of sound comprehension as well as in the disturbance of meaning comprehension. A patient whose meaning comprehension is preserved but whose phoneme comprehension is damaged, and who has lost, *e.g.*, the distinction of liquids, surely knows the meanings of *Rippe* and *Lippe*. Both words are homonyms for him, however, and he cannot identify the meaning of either word in any given case so long as the context or the situation does not supply him with any more specific information.

On the other hand, patients with impaired meaning comprehen-

[35] The traditional concept of the "sound of the letter" in speech pathology shows, despite the naiveté of the term and of its motivation, that it is absolutely necessary to separate in the study of aphasia the linguistically relevant properties of the phoneme ("phonetic unity," in Kleist's terminology) from the simple combinatorial and optional variants. Froment (358) accordingly distinguishes between "fundamental sounds or phonemes" and "all the differences in pronunciation of the same sound".

[36] If two words are distinguished by several phonemes (or by a sequence of them), the distinctive role is distributed among them.

sion but uninjured sound comprehension can distinguish two words whose meanings they cannot understand but which are similar in sound by means of their non-significant phonological differences, and thereby perceive them as two different, although enigmatic, meaningful units (see *e.g.*, Isserlin 209).[37] Insofar as the aphasic loses the ability to separate closely related meanings in his use of language, words related in meaning are stripped of every functional distinction, and consequently the justification for preserving these distinctions is also lost. Word amnesia occurs, and one of the words related in meaning replaces the others and takes over their meanings. Thus a patient with meaning muteness characterized, *e.g.*, every useful activity with the verb "to build". Kleist refers to the similar word poverty of children learning to speak and to the equally large range of meaning of the small number of words which are available to them (γ 850).

Both meaning and sound disturbances result, therefore, in an expansion of homonymy. In the former, a phonological unit corresponds to a multiplicity of interlinked meanings, while in the latter such an interlinkage is never present, and a simple homophony occurs. Indeed, in both kinds of disturbances (just as in their exact correspondences in child language) an expanded ambiguity (polysemy) of the linguistic sign necessarily arises, and "the active use of the word as interpreter of the concept" is impaired. The more extensive the sound disturbance, the more the distinguishing of words, or of meanings, is hindered. With the decreasing number and frequency of phonemes and phoneme combinations, the number of homonyms (phonologically identical words), and especially the number of paronyms (phonologically similar words), which likewise obstruct the distinguishing of words, naturally increases. In homonymy the marks of distinction disappear, in paronymy they decrease in number. With whatever level of language aphasia is concerned, it is always the sign function of the

[37] The meaningfulness of the words is grasped, but there is no reaction to their individual meanings. One could cite similar examples of children who grasp certain phonological differences between words at the threshhold of their language learning without having comprehended the meanings of these words.

linguistic units in question that is injured:[38] in phonemes, their distinctive value; in vocabulary, lexical meanings; and in morphological and syntactical forms, grammatical meanings. Often the lesions of the individual levels are connected with each other. If the distinction between two homogeneous units loses its linguistic value, one of these units is then supplanted by the other. We then speak of sound amnesia where sound disturbances are concerned, of word amnesia where disturbances of word meanings are concerned, and of agrammatism where disturbances of grammatical meanings are concerned. Or if both units, in spite of the loss of their different functions, are retained in a weaker stage of these disturbances but are confused and indiscriminately used for one another, then we speak of sound paraphasia,[39] of verbal paraphasia and of paragrammatism.

Jackson's warning of the year 1878 is still relevant: "We must not classify on a mixed method of anatomy, physiology and psychology, any more than we should classify plants on a mixed natural and empirical method, as exogens, kitchen-herbs, graminaceae, and shrubs" (115). A purely linguistic classification of aphasic disturbances is necessary, since it satisfies this call for a uniform criterion, and at the same time can be easily realized, since every aphasic disturbance is characterized by the loss of some linguistic value. The newest pathological works comply to an even greater extent with this formulation. In linguistics there are two aspects of the linguistic act that are distinguished — emissive and receptive — and correspondingly, in the study of aphasia, different kinds of linguistic muteness and deafness. On the other hand, linguistics distinguishes semantic and phonological units, *i.e.*, primary signs, which are related to concrete entities, and secondary signs, which are related to signs. Similarly, aphasic disturbances, according to whether they impair semantic or phonological units (therefore signs for concrete entities or signs for signs), are classified in the newest pathological literature as

[38] Head's assertion, that every type of aphasia affects in some manner the "symbolic formulation", is thus correct. Moreover, de Saussure has penetratingly sketched this position: "In all cases of aphasia or agraphia, what is affected is less the faculty of producing a given sound or of writing a given sign than the ability to evoke by means of an instrument, regardless of what it is, the signs of a regular system of speech. ... Beyond the functioning of the various organs, there exists a more general faculty which governs signs, and which would be the linguistic faculty proper" (*op. cit.*, 27).

[39] More exactly, "single sound paraphasia", cf. Kleist γ 691.

meaning disturbances and sound disturbances. The fundamental linguistic classification of meanings as lexical and grammatical (or, according to Fortunatov's terminology, as real and formal) is also important for the study of aphasia and underlies the delimitation of agrammatism. Every linguistic unit functions in a sequence. Depending upon whether one treats 1A) the characteristics of the units in question, 1B) their characteristics in relation to the sequence, or finally 2) the characteristics of the sequence as such, one speaks, with regard to phonemes, 1A) of their qualities, 1B) of their prosodic features, 2) of combinations. Similarly the linguist distinguishes, with regard to the word as a grammatical unit 1) morphology, namely A) word formation and B) word inflection, and 2) syntax, *i.e.*, the form of word combinations. The consistent use of these distinctions could dispose of a number of misunderstandings in the study of aphasia.

11. LINGUISTIC CHARACTER OF APHASIC SOUND-DEAFNESS AND SOUND-MUTENESS

Complete or partial sound-deafness was often not only called "sensory aphasia", but was also interpreted as such. Indeed, the nature of the disturbance, as especially Pierre Marie convincingly showed, does not have its roots directly in the concrete acoustic, but rather in the conceptual, "semiotic" sphere ("an intellectual deficiency relating specifically to language", according to the formulation of this scholar). Not the perception as such, but rather its linguistic value is impaired. A patient who is unable to grasp certain elements of his language, but whose perception of all the remaining auditory sensations is normal (and, therefore, does not suffer from any auditory agnosia) cannot have any sensory defect.

It is impossible to explain the perception of speech sounds by a kind of elementary auditory perception independent of pitch differences and of noises. The perception of sounds is dependent on uniquely those laws which convert the acoustic-motor raw material into elements with semiotic (sign-functioning) value, and therefore on the structural laws of the phonemic system, and not on the acoustic characteristics of the sound in relation to pitch and noise. Every speech sound represents a complex of distinctive features, and each of these features functions as the member of a binary opposition which necessarily implies the opposite member. What the pathologist is confronted with is not the existence of three special

delimited classes of sound perceptions, but primarily the essential distinction between three separate types of values that are performed by sound phenomena. Indeed, the same physical facts, *e.g.*, distinctions of pitch, can occur on the one hand as musical values, and on the other hand as a means of differentiating meaning. In the first case the absolute value of the pitch differences, or intervals and their scales, is important, whereas in language the contrast of a neutral (unmarked) and raised or lowered pitch is significant (cf. in the Yoruba language *tu*, in normal pitch "spear", in high register "untie", and in low register "rest").[40] Let us use the well-known and clear comparison of language with a board game. It is easily possible to use chessmen for checkers. "What constitutes them phenomenally and physically is completely inconsequential and can change arbitrarily. They become tokens of the game in question rather through game rules, which give them their fixed game meaning."[41] The interpretation and classification of sound phenomena is entirely different according to their function, and accordingly the following are distinguished: 1) differences of pitch as musically utilized sound phenomena, 2) sounds as linguistically utilized sound phenomena, and 3) sound phenomena which have neither musical nor linguistic value, but act rather as mere marks of different sounds ("noises" in normal usage).[42] In the every day life of the average person, language (or sound) plays a much more important role than music (or pitch), and in this connection it is completely understandable that in some people, especially those who are unmusical, simple tones can come to acquire linguistic values, and that thereby their similarities to vowel sounds easily emerge.[43]

It is customary to compare the agrammatic "telegraphic style" and the similar speech form of children in particular stages of development with imperfectly controlled foreign speech (see Isserlin 1022), but the analogy is also valid for phonemic disturbances. In the ordinary comprehension of the phonemes of a foreign language, there are striking correspondences which help to explain linguistically the pathological facts of sound-deafness. A speaker of Chinese who in listening to a European language does not perceive the difference between *r* and *l*, a Scandinavian who often does not

[40] See D. Westerman and J. Ward, *Practical phonetics for students of African languages* (Oxford,1933), 169; cf. O. Gjerdman, "Critical remarks of intonation research", *Bull. of the School of Orient. Studies*, III, 495ff., and N. Trubetzkoy, *Grundzüge der Phonologie* (= *Trav. du Cercle Ling. de Prague*, VII), 182ff.

[41] E. Husser, *Logische Untersuchungen*, II (Halle, 1913²), 69.

[42] Cf. W. Köhler in *Zeitschr. f. Psychol.*, LXXII, 80ff.

[43] Cf. esp. C. Stumpf, *Die Sprachlaute* (Berlin, 1926), 326ff.

distinguish the Russian or German *z* from *s*, a Russian or Bulgarian who commonly remains deaf not only to the quantitative but also to the pitch oppositions of the Serbocroatian syllabic phonemes are all thoroughly normal from a sensory point of view and suffer neither from impaired hearing nor from any reduction in the ability to perceive. Since there is no distinctive difference in Chinese between the two liquids, in Russian or Bulgarian between long or short vowels, or vowels with rising and falling pitch, in the Scandinavian languages between voiced and voiceless sibilants, the non-native speaker is therefore not at all accustomed in the language in question to consider these, to him, irrelevant fine points, and his attention and memory must be thoroughly exercised and newly trained so that the otherwise equivalent words of the foreign language can be recognized and will no longer count as homonyms (*e.g.*, for a Swede, Russian *zlóva slóva* "of the bad word", or for a Bulgarian, Serbian *ʼsela* "of the village" with rising pitch on *e*, *ˋsela* "the villages" with falling pitch on *e*, and *ˋsēlā* "of the villages", a form which is distinguished only by means of the long vowels). The aphasic who has forgotten the common distinctive value between *r* and *l* or between *z* and *s*, or between rising and falling word pitch,[44] takes on the aspect of a foreigner in relation to his native language and therefore can no longer discriminate between such phonological differences.

But what is most difficult for a foreigner is not to grasp but to use, and especially to use correctly, a foreign phonemic distinction which is lacking in his own language. It is not just a question of the difficulty of the unfamiliar articulation. Even if a speaker of Chinese is successful in imitating the *r*-sound, which is not found in his language, he must still make a special effort to remember that it must actually be used in speech, and to be able to choose

[44] Dr. Hjalmar Torp (Oslo) has drawn my attention to the frequent loss of the Norwegian pitch opposition in aphasics, and the pedologist Rutti Bjerknes (Presterod), to the lack of the same distinction in backward children. The falling "double pitch" (accent II) is thus replaced by the rising "single pitch" (accent I): *ˋlyse* "to shine" is pronounced like *ʼlyse* "the light"; on the Norwegian pitch opposition, see O. Broch in *Mélanges Pedersen*, 308ff., and C. Borgström in *Norsk Tidsskrift Sprogvidenskap*, IX, 260ff.

correctly between the two liquids in particular cases. Either he does not use the foreign phoneme, or *r* and *l* are confused (*Paris* can become *Palis* and at the same time *London*, *Rondon* and *reflector*, *lefrectol*). It is not difficult for a Bulgarian or Pole to lengthen a vowel at will, but it is a much more strenuous task for him actually to preserve these long vowels when he speaks Serbo-croatian or Czech, and, what is more, in the correct places, since a phonemic opposition of long and short vowels does not occur in his native language.

The so-called aphemic disorders (sound-dumbness or, as it is sometimes called, partial motor aphasia) and in like manner the beginning stages of child language present a similar picture. Articulations whose autonomous phonemic value has been lost in patients and is not yet incorporated by the child are lacking or are used in place of each other. There are borderline cases: if the sound distinction in question or its use in words is indeed known but is felt as foreign or strange, it overstrains the attention; and while it is preserved in special situations, it is avoided in unaffected speech. Many Russians living in Czechoslovakia have learned the quantitative distribution of Czech vowels and can, if necessary, use them accurately, but in fluent speech they easily let this distinction go now and then. "A child", says Sully, "can often articulate better than he himself wants to". A one-and-a-half-year-old English girl, *e.g.*, who was teased because she constantly said *mudder*, laughingly quite accurately pronounced *mother*, with the interdental fricative, although she afterwards returned to her former pronunciation of this word (133). There are also less serious cases of sound-dumbness where the patient, under coercion, speaks more correctly for a while, only to slip back again into his usual sound poverty.

This aphasic mutilation of sounds resembles admittedly the so-called arthritic disturbances (*i.e.*, disturbances of the senso-motor apparatus), and this similarity has often misled observers. But as Liepmann (β) has clearly pointed out, a sharp fundamental distinction is necessary here. The lack of both masticating and swallowing disturbances and of other pseudo-bulbar symptoms, as well as very often the undisturbed state of the expressive elements

of speech, proves that in aphemic disturbances "the conceptual design" rather than the articulation of speech or the kinaesthetic memory is impaired; or in other words, the knowledge of particular linguistic operations, rather than the innate instrument which is required for their performance, is lacking.

It has rightly been stressed that not only the mnemic connection of purely kinaesthetic elements, but also the mnemic connection of limb-kinetic complexes with the remaining possession of memory is a prerequisite for the completion of every action (cf. Isserlin 188). It must be added that as far as the speech sound is concerned there is a mnemic connection not only of the kinetic and superimposed acoustic components, but also, and more important, with that component of the speech sound concerned with content — *i.e.*, the sign-functioning element — to which the first two components are subordinated. Liepmann contrasts sound-deafness (and receptive aphasia in general) as "an agnosia for conventional signs, for linguistic symbols", with agnosias in the narrower sense, *i.e.*, "disturbances of sensory impressions which are not symbols" (α 484). Accordingly, one can separate sound-dumbness (and emissive aphasia in general) as an apraxia for conventional linguistic signs, from true apraxia, *i.e.*, the inability to perform movements associated with objects, rather than symbolic movements.[45] With the failure of the sign-functioning value, the former can sometimes cease, while the latter can sometimes remain preserved.

The production of sounds is a goal-directed activity whose primary purposes lies in the distinctive value of the sound. To the extent that this activity is divested of its purpose, the inability arises, well-known to the pathologists, to accomplish a separate movement (in our case a self-sufficient articulation). Within the framework of another movement combined with it, however, (in our case an articulation which distinguishes words, *i.e.*, which is motivated by meaning) such a separate movement can be accomplished (see Pick ε 1441). Similarly, in apraxia, habitual movements toward an object succeed considerably better than the same movements without an object.

[45] Pötzl correctly objects to the ranking of agnosia and apraxia above aphasic disturbances and advocates putting agnosia, language deafness, apraxia and language muteness together under a higher concept: "One may characterize these as disturbances of the selective comprehension, i.e. of a single integrated ability to perform" (45).

The autonomy of aphasic disturbances, in contrast to apraxia, finds its explanation in the sign function of speech elements, so that the mutually relative autonomy of aphasic phonemic and meaning disturbances corresponds to the entirely different sign function of the linguistic unit affected. Every morphological unit, from the smallest to the largest — *i.e.*, from the morpheme to the word — has a constant meaning, every phoneme a constant distinctive value. The morphological unit is related, as we have said, to something concrete, and this relation is for one and the same unit a manifold one: In the expressions *Bucephalus is a horse*, and *this cart-horse is a horse*, *e.g.*, the concrete relation of the expression *a horse*, but not its meaning, has changed, as Husserl specifies (*op. cit.*, 46ff.). The phoneme is related to a morphological entity, and this relation is also, for one and the same phoneme, a manifold one. Thus the French nasal phoneme *ã*, *e.g.*, expresses simply that the different words and types of words in which it occurs (as *an*, *allant*, *enlever*, *vente*, *sang*, *lent*, etc.) contrast in their meaning with words containing a different phoneme in the same position (*e.g.*, *sang* with *saint*, *son*, *ça*, *sot* or *lent* with *lin*, *long*, *las*, *laid*, *loup*). The phoneme, therefore, has no direct relation to anything concrete and participates in the distinguishing of meanings without having any meaning itself. The relative frequency of cases of sound-dumbness in relation to the remaining forms of language-dumbness appears to be connected with this poverty of content, which opposes the phoneme to the meaningful units of language (see *e.g.*, Kleist 804). For the same reason, sentence intonation (and the phonological elements characteristic of the sentence in general) often are preserved in aphasic sound disturbances. In contrast to the phoneme, they possess their own constant meaning, as, *e.g.*, the specific intonation at the end of the sentence, which marks the end of a meaningful unit.

Oddly enough, the same Pierre Marie who understood clearly the conceptual aspect of the speech sound, or of the loss of speech sounds in his analysis of sound-deafness, failed to appreciate the similar characteristics of sound-dumbness, although it is simply a question of recognizing the emissive counterpart to the corresponding receptive disturbance. Indeed, both types of disturbances, "in their nature and appearance", are connected very closely with each other. This same scholar even showed himself inclined to group

sound-dumbness, not with the other forms of aphasia, in spite of its frequent connection with them, but with the arthritic disturbances, since the essential aphasic characteristic, the damage to "linguistic intelligence" (or in other words, the impairment of the intellectual functions of speech) is ostensibly absent in sound-dumbness.

According to Niessl von Mayendorf as well, there exists only a gradual distinction between aphasic sound-dumbness and dysarthria. It would be more correct, however, to speak of a gradual distinction between sound-deafness and sound-dumbness and, with Kleist and Fröschels (β 78), to consider the former, as opposed to the latter, as a lighter form, or retrogressive stage, of phonemic disturbance and to cite as analogous either the "hearing-dumbness" of the child (see §§ 5, 8) or the common inability to actively manipulate many foreign linguistic sound distinctions, when these are nevertheless controlled passively. Niessl believes that the boundary between aphasic and arthritic disturbances is "artificially and misleadingly drawn". An aphasic suffering from sound-dumbness as well as a child learning to talk or an adult attempting to speak a foreign language, speaks dysarthritically, and consequently suffers from an "ataxia of the speech muscles" (32f.). Nevertheless, the loss of babbling sounds by children is not to be explained by a suddenly appearing awkwardness of the speech muscles. Indeed, the nondistinction of rising and falling pitch or of long and short vowels in the Bulgarian pronunciation of Serbian words has nothing whatsoever to do with dysarthria, ataxia of the speech muscles or with the infrequent "tongue-lip mechanism" (see Henschen VII, 129). These same sound features (distinctions of pitch and duration) are used by speakers of Bulgarian, although they have a different linguistic function, that is, they are used as features characteristic of the sentence (sentence intonation, tempo). The fact that, in polyglots suffering from sound-dumbness, one language can be affected while another remains undamaged proves that they cannot be suffering from an "ataxia of the speech muscles". And from the frequent cases of "single sound paraphasia", which one could interpret as an incomplete or partially restored sound

aphasia (cf. § 10), it follows that phonemic distinctions can be lost without the loss of any articulation. Thus there are, *e.g.*, patients who produce both liquids, but nevertheless indiscriminately replace *r* with *l* and conversely *l* with *r* (cf. Stein γ 104).

Ombredane, the most distinguished observer of pathological sound change, understood well that partial sound-dumbness is fundamentally the reduction in the ability to differentiate (β 409). The system of distinguishable articulatory gestures ("gesticulation pneumo-laryngeal-buccal") is reduced, and since these are gestures which establish meanings ("gesticulation significative", see 363ff.), the sign function is crucial for distinguishing them. Neither in the static description of such a gesture system nor in the analysis of its dissolution can one refrain from taking this point of view and get by on "purely physiological grounds".

II

STRATIFICATION OF THE PHONOLOGICAL SYSTEM

12. RELATIVE AND ABSOLUTE CHRONOLOGY OF PHONOLOGICAL DEVELOPMENT

Whether it is a question of French or Scandinavian children, of English or Slavic, of Indian or German, or of Estonian, Dutch or Japanese children,[1] every description based on careful observation repeatedly confirms the striking fact that the relative chronological order of phonological acquisitions remains everywhere and at all times the same.

While the succession of phonological acquisitions in child language appears to be stable in its fundamental characteristics, the speed of this succession is, in contrast, exceedingly variable and individual, and two "newly added phenomena" which directly succeed each other in one child can in another child be separated by many months, and even by years. There are children who acquire the sound system of their native language especially quickly and who are in full possession of it by about the middle of their second year, while others still have not completely mastered their phonemic system at school age, as Gutzmann, *e.g.*, established for German, or Helga Eng (58) for Norwegian, school children.[2]

[1] Data were available to us only from these languages (cf. below the bibliography employed). We were able to consider Swedish, Norwegian, and Danish of the Scandinavian languages; Russian, Polish, Czech, Serbocroatian and Bulgarian of the Slavic languages, and the Zuñi language in New Mexico of the American Indian languages (see Kroeber).

[2] According to Gutzmann's Berlin experience "almost half of the children just starting school, who were about six years old, did not have normal pronunciation" (α 19f.), whereas more recent statistical data indicate that only 1.21% of the school children of working and lower middle classes in Vienna still do not have normal pronunciation.

At a particular stage of development, as Axel Kock has already observed, the Swedish child says *tata* for "kaka", the German child *topf* for "kopf", the English child *tut* for "cut", and the Japanese child also changes *k* to *t* (389).[3] The absolute chronology, in contrast to the relative chronology, however, is extremely vacillating. In many children, velar stops are acquired shortly after dentals at the beginning of the second year or sometimes even during the first year; in others, only about the third year. Often children replace all velars with corresponding dentals until their sixth year.[4] The lack of velars is not infrequently found even in school children of eight to nine years.[5] It is apparently a universal fact, then, that palatovelar sounds develop in child language only after dental sounds.

These cases of retarded language development, which are like a slow motion film, are especially instructive. Equally instructive, on the other hand, is the life-long preservation of one of the beginning stages of the language of imbeciles. In this case the infant sound system is preserved, and the fricatives continue to be replaced by stops (cf. Galant 430, Maupaté and the further bibliography in Nadoleczny α 149).

13. MINIMAL CONSONANTISMUS AND MINIMAL VOCALISMUS

At the beginning of the first stage of language development, the acquisition of vowels is launched with a wide vowel, and, at the same time, the acquisition of consonants by a forward articulated stop. An *a* emerges as the first vowel, and generally a labial as the first consonant, in child language. The first consonantal opposition

[3] Cf. in French children *tã* "carte", *tata* "caca" (Bloch α 38), in Serbian children *tata* "kaka" (Pavlović), in Estonian children *taal* "kukal" (Saareste 17) — in short, "children in all countries tend to substitute *t* for *k*" (Jespersen β 85).

[4] See *e.g.*, Bloch α 42, Ronjat 58.

[5] Cf. Gutzmann: "I have observed very intelligent children of eight and nine years who cannot pronounce *k*, although no reason whatever existed for it" (ε 111).



Fig. I. Tlingit woman with labret.

is that of nasal and oral stop (*e.g.*, *mama-papa*), which is followed by the opposition of labials and dentals (*e.g.*, *papa-tata* and *mama-nana*).

These two oppositions form the minimal consonantal system of the languages of the world. These are the only oppositions that cannot be lacking anywhere,[6] provided that there is no mechanical deformity of the speech apparatus (dyslalia labialis). Thus, the lack of labial consonants in the female language of several central African Negro tribes is caused by the ritual of lip mutilation. In this case the females substitute velars for the labials of the male language.[7] The general loss of labials in the language of the Tlingit Indians has also arisen because of a traditional external factor, the large and heavy labret that was formerly worn at all times both by the men and women.[8] Even in these cases the labial series finds a characteristic substitute in velar consonants with an accompanying *u*-sound: in this way, *e.g.*, *yăk* ("shell fish") and *yăkᵘ* ("canoe") are distinguished.[9]

[6] Bindseil has observed: "I know of no language in which *t* is lacking" (*Abhandlungen zur allgemeinen vergleichenden Sprachlehr*, Hamburg, 1838, 358).
[7] In the Ubangi women ("négresses à plateaux"), *e.g.*, to which the Danish phonetician Prof. H. J. Uldall has drawn my attention.
[8] See G. L. Cleve, "Die Lippenlaute der Bantu und die Negerlippen, mit besonderer Berücksichtigung der Lippenverstummelungen", *Zeitschr. f. Ethnol.*, XXXV (1903); Aur. Krause, *Die Tlinkit-Indianer* (Jena, 1885); S. Ratner-Sternberg, "Muzejnye materialy po tlingitam", *Sbornik Muzeja Antropol. i Etnogr.*, VIII (1939). Our *Figure I* is drawn from the last-mentioned work (Table I).
[9] See John R. Swanton, "Tlingit", *Handbook of American Indian Languages* by Fr. Boas, I (1911), 195.

In child language these two consonantal oppositions are followed by the first vocalic opposition (in backward children not until about the third year, cf. Pavlović 44): a more narrow vowel is opposed to the wide vowel, *e.g.*, *papa-pipi*. Often a narrower and more front vowel (*e.g.* *ɛ*) appears in the beginning simply as a variant of the fundamental vowel *a*, which is either optional (cf. Grégoire 88f., concerning a vacillation in pronunciation between *papa* and *pɛpɛ*, *tata* and *tɛtɛ*), or combinatorial: usually *a* after labials, *ɛ* after dentals. Guillaume (52) gives the example of a French child who says *papa*, *dédé* from *téter* ,and *dé* "generic name for all quadrupeds" from the conventional imitation of bleating *bé*. Many children are plainly not able to produce a labial sound before a front vowel (cf. Feyeux 281). But as soon as both vowels become separate phonemes, the child attempts to intensify the difference of wideness, and *e* is narrowed to *i* (cf. *e.g.*, Grégoire β 129).

The following stage of the child's vocalic system introduces either a splitting of the narrow vowel into a palatal and velar, *e.g.*, *papa-pipi-pupu*, or a third more central degree of opening, *e.g.*, *papa-pipi-pepe* (cf. Grégoire β 245).

Each of these two processes leads to a system of three vowels, which is the minimal vocalic system presented by the languages of the world. The first variety of this minimal vocalic system, the so-called "fundamental triangle", is found especially frequently both in child language and in the languages of the world (*e.g.*, Persian and Arabic.)[10] But the other variety, the so-called "linear vowel system", is also represented both in child language and in the languages of the world. In this case, only the degree of opening is relevant, whereas the different vowels of the same degree of opening are either simply optional variants which do not affect meaning, or are simply conditioned by the adjoining vowel sound. *E.g.*, a Russian boy of thirteen months referred to a purse as *pún'a* and *pín'a* indiscriminately (Hoyer 377); the child of Bloch repro-

[10] See N. Trubetzkoy, *op. cit.*, 97f. Most frequently the basic triangle occurs as a "sub-system", *e.g.*, the unstressed vowel system of stage Russian, the long vowels of Common Czech, and the short vowels of Hebrew (see H. Birkeland, *Akzent und Vokalismus im Althebräischen*, Oslo, 1940).

duced the French words *l'eau* "the water" and *le lait* "the milk" identically as *lólő* (α 56), and the son of Ronjat reproduced the words *beau* and *bon* as *be* (42). The above-mentioned (§ 8) one-year-old Czech girl, who consistently used *a* and *u* after labials and correspondingly *e* and *i* after dentals, presents thus a close parallel to the vocalic system of the West Caucasian languages, in which the choice between different vowels of the same degree of opening, as Trubetzkoy stressed (*op. cit.*, 87f.), depends only on the adjoining consonants.

Both varieties of the minimal vocalic system, as well as the minimal consonantal system, are characterised fundamentally by the presence of phonemes which combine two distinctive qualities. Thus, *e.g.*, in the linear vowel system which contains three degrees of opening, the central vowel is opposed to the narrow vowel as a wide vowel, and at the same time to the wide vowel as a narrow vowel. In the fundamental vowel triangle, *u* is narrow compared to *a* and velar (or rounded) compared to *i*. In the consonantal system which contains *m*, *p* and *t*, *p* is oral in opposition to the nasal *m* and at the same time labial in opposition to the dental *t*. Accordingly, the general law is that the concept of the phoneme is never identical with that of the distinctive feature in any language, but is at all times superordinated to it.

Bühler has stated that "In the beginning our children articulate neither German nor Caucasian sounds."[11] This statement is correct, but means two different things, depending on whether the pre-language babbling period or the initial stage of language is meant. In the first case the child can produce all articulations equally well, whether they are German, Caucasian, or those found only in African languages. On the other hand, during the following stage — that of language development — the child possesses in the beginning only those sounds which are common to all the languages of the world, while those phonemes which distinguish the mother tongue from the other languages of the world appear only later. Thus Van Ginneken appropriately characterizes the manner of language development of the Dutch child: "From general human language to Dutch" (20).

[11] *Arch. f. d. ges. Psychol.*, XCIV (1935), 411.

14. IDENTICAL LAWS OF SOLIDARITY IN THE PHONOLOGICAL DEVELOPMENT OF CHILD LANGUAGE AND IN THE SYNCHRONY OF THE LANGUAGES OF THE WORLD

If we consider now those acquisitions of the child's consonantal or vocalic system which exceed the minimum already discussed, a fact of great importance comes to light — the amazingly exact agreement between the chronological succession of these acquisitions and the general laws of irreversible solidarity (*solidarité irréversible*, cf. Jakobson 28) which govern the synchrony of all the languages of the world. Logically the solidarity, *i.e.* the necessary connexion of two elements, can, as is known, be "bilateral or unilateral, depending on whether the regularity in question is reversible or not" (cf. Husserl *op. cit.*, 265).

The acquisition of fricatives presupposes the acquisition of stops in child language; and in the linguistic systems of the world the former cannot exist unless the latter exist as well. Hence, there are no languages without stops, whereas P. Schmidt cites a number of Australian, Tasmanian, Melonesian, Polynesian, African and South American languages in which fricatives are completely unknown.[12] In Kara-Kalpak[13] and in Tamil,[14] to cite additional examples from another continent, there is no autonomous category of fricatives; stops and fricatives appear as combinatory variants

[12] *Die Sprachfamilien und Sprachenkreise der Erde* (Heidelberg, 1926), 287. Cf. A. Sommerfelt: "These phonemes are unknown to all of the Australians and were unknown also to the Tasmanians. The *s* is found only at the northeast point of Cape York. In certain Melanesian languages as well, the *s* does not occur, as is also the case with the languages of the Andaman Islands, where, in addition, spirants do not occur" (*La langue et la société*, Oslo, 1938, 51).
[13] See E. Polivanov, *Nekotorye osobennosti kara-kalpakskogo jazyka* (Taschkent, 1933).
[14] See J. R. Firth, *A short outline of Tamil pronunciation* (appendix to Arden's *Grammar of Common Tamil*, 1934²), and Trubetzkoy, *op. cit.*, 134f.

of the same phoneme — the first as basic variants, the others as variants conditioned by the environment. In Tamil *e.g.*, stops become fricatives after a vowel.

The child first changes fricatives to the corresponding stops — *f* to *p*, *s* to *t*, and insofar as the palatovelar series is established before the appearance of fricatives, *x* and *ʃ* to *k*. For the change of *ʃ* > *k* (or *ʒ* > *g*) cf., *e.g.*, the formation *kam*, with which Edm. Grégoire at seventeen months repeatedly reproduced the name "Charles" (β 135),[15] or sound sequences such as *r'águ* "režu", *mag'i* "muzik", which were frequently uttered by a two-year-old Russian boy (Blagoveščenskij 83). In the grouping of consonants into basic classes according to place of articulation, the traditional classification separates the alveo-palatals *ʃ*, *ʒ* from the palatals and classifies these consonants with the dentals. But this division is absolutely superficial and conventional. It is not based on any productive criterion and does not take into account the abundant linguistic evidence for the fundamental connection between the alveo-palatals and the true palatals. What characterizes the *ʃ*-sounds in contrast to the *s*-sounds is the greater retraction of the tongue and thereby the creation of a resonance chamber between the teeth on the one hand and the narrowing (or the closure) on the other. *ʃ*, *ʒ* and the corresponding affricates are thus distinguished from *s*, *z* and the corresponding affricates by the same characteristic feature as the palatal stops *c*, *ɟ* are from the dental stops *t*, *d*. In the former the place of articulation is located behind, and in the latter, before the dominant resonance chamber of the oral cavity.[16] This opposition corresponds to that of the velars and labials: the place of articulation is located, in the former, behind, and in the latter before, the undivided oral resonator. Thus, the velars and palatals (including the alveo-palatal consonants) can be opposed,

[15] A backward girl (of four years) says *koko* "chaud" (Decroly).

[16] Cf. A. Thomson, "Bemerkungen uber *š*-Laute", *Zeitschr. f. slav. Philol.*, XI (1934), 345ff., esp. 354f., also Rousselot, *Principes de phonétique expérimentale*, II (1925), 916f., J. Chlumský, *Les consonnes anglaises* (Prague, 1924), 23, and G. Panconelli-Calzia, *Die experimentelle Phonetik in ihrer Anwendung auf die Sprachwissenschaft* (Berlin, 1924), 79.

as back or palato-velar sounds, to the labials and dentals, as front sounds.[17]

The acquisition of back consonants presupposes in the linguistic development of the child the acquisition of front consonants, *i.e.*, labials and dentals; and, in particular, the acquisition of back oral and nasal stops presupposes the acquisition of front oral and nasal consonants. Similarly, the acquisition of back fricatives presupposes the acquisition of front fricatives, and, on the other hand, that of back consonants. The existence of back consonants in the languages of the world presupposes accordingly the existence of front consonants. That is, *k* as well as *c* (and *ŋ* as well as *ɲ*) require solidarity with *p* and *t* (or *m* and *n*), and *x* as well as *ʃ* require solidarity with *f* or *s*,[18] and in addition with *k* or *c*.

The solidarity is not reversible: the presence of front consonants (or individual classes of them) in no way requires the presence of back consonants (or individual classes of them). In other words, no language has back consonants without containing front consonants. On the other hand, there are some languages with labials and dentals, but without back consonants, as, *e.g.*, the language of Tahiti in which both velars — *k* and *ŋ* — have changed to '[19] and Kasimov-Tatar, in which all velars — both stops (voiceless and voiced, oral and nasal) and fricatives — were also replaced by the glottal stop.[20] In some languages the lack of palato-velar sounds is

[17] See my article in *Proceedings of the Third Int. Congress of Phonet. Sciences* (Ghent, 1939), 36. Brucke's assertion, that *ʃ* was combined from both *s* and *x*, is correct from the standpoint of the systematic patterning of consonants; and Jan Hus, before the fifth century, showed his penetrating understanding of the problem when he separated the Czech *c*, *ɟ*, *ɲ*, *ʃ*, *ʒ*, from *t*, *d*, *n*, *s*, *z* by means of the same diacritic mark. Also, retroflex sounds, insofar as there are no palatals of the same manner of articulation which are opposed to them, rank with the palatal or back class of consonants. Characteristic in this connection is the change of *ʈ* > *k*, *ɳ* > *ŋ* in Norwegian children: *oɳʈli* "properly" > *oŋkli* (G. Morgenstierne, *Indo-Iranian frontier languages*, II (1938), 49).

[18] For stops (both nasal and oral, but not fricatives) the presence of the opposition dental ~ labial is obligatory, insofar as there are no external obstacles (cf. §§ 13, 29).

[19] See O. Dempwolff, *Vergleichende Lautlehre des austronesischen Wortschatzes*, I (1934), II (1937) = *Zeitschr. f. Eingeb. Spr.*, Supplements XV, XVII.

[20] See E. Polivanov, *Vvedenie v jazykoznanie* (Leningrad, 1928), 85f.

limited to oral consonants (*e.g.* in the language of Samoa, where *k* became the glottal stop, but where *ŋ* was preserved),[21] and in many languages the system of nasal consonants is represented solely by *m* and *n*, whereas we know of no language which possesses back but not front nasal consonants. Accordingly, the velar nasal consonant appears in English, Scandinavian and German children, and, similarly, the palatal consonant in French, Czech and Serbocroatian children, only after *m* and *n*.

At first both of the back nasal consonants are replaced in the child by *n*, and, generally, the back consonants are replaced by the corresponding dentals. Thus, *t* is substituted both for *k* (cf. § 12) and for the palatal stop *c* (*e.g.*, in Czech and, according to J. Lotz, in Hungarian). When *k* finally appears, mistakes in the use of both phonemes (*k*, *t*) arise at first, especially those caused by a hypercorrect repression of the expected *t* in favor of *k*,[22] which is sometimes inaccurately interpreted as a sound change of *t* > *k* (see Fröschels β 97). Consonant assimilations cannot be offered as evidence for a sound change of this kind either, as, *e.g.*, in a Swedish child, *gak* "gata", *geka*, "Greta", *gakk* "god natt", *guk* "duk", *gakka* "docka" (Bolin 209). In the development of child language, *k* therefore merges with *t*, and only later does *k* emerge as a separate phoneme.[23] Occasionally, an intermediate stage is introduced between these two stages in which, although the velar series is not yet established, the two phonemes are already distinguished. In this case, a glottal stop corresponds to *k* (or velars, in general) of the mother tongue (cf. *e.g.*, Ronjat 54). Exactly the

[21] See Dempwolff, *o.c.*, II, 167ff.
[22] Thus a child said *Duten Ta Herr Dotta*, but then for a while *Guken Gag Herr Goka* (Nadoleczny α 61).
[23] The sounds *k* and *t* can appear at first only as two combinatorial variants. Thus the records of Grammont show that a child used the dental stop only intervocalically, but the velar initially and finally (e.g., *cateau* "gâteau", *cütine* "cuisine", *caté* "cassé", *pati* "partir", *peuteu* "monsieur", *pèti* "merci", *quépic* "qui pique"); the initial dental therefore becomes velar (*còtüc* "du sucre", *coupé* "souper"), the medial back sibilant becomes dental (*caté* "caché", *boudie* "bougie"), and the back stop is shifted by metathesis to initial position (*capet* "paquet", *cópou* "beaucoup", *coupé* "bouquet").

same mutation occurs in the languages of the world, as we have mentioned above (cf. also § 18).

Just as the child (*e.g.*, a Czech, Serbocroatian or Hungarian child) for a prolonged period possesses only one of the two series of back stops of his native language, a large number of the languages of the world contain only a single series of back stops, in contrast to the obligatory two series of front stops. With a few isolated and doubtful exceptions, the back oral stops are replaced only by velars, whereas the back nasal consonants are more frequently replaced by palatals. Both back as well as front fricatives can be replaced by a single series — the latter generally by dentals and the former often by palatals. If, in the languages of the world or in child language, the fricative consonants are limited to a single phoneme, this phoneme is as a rule represented by *s*.[24] Only the friction, and not the place of articulation, is relevant to this phoneme, when it is not opposed to any other fricative. One can accordingly characterize it as an "indefinite fricative phoneme". The same kind of phoneme possibly has back combinatory or expressive variants. Such was the case originally, *e.g.*, with the Proto-Slavic *s*-phoneme, which was replaced by *x* after certain phonemes and, in addition, in some expressive formations. In cases where there is no opposition of front and back fricatives, however, this *s*-sound is not sharply differentiated from an *ʃ*-articulation either in the languages of the world or in child language.[25]

A so-called half-stop consonant (or affricate) which functions as an opposition to the corresponding stop consonant in phonemic systems, is acquired by the child only after the fricative of the same series. The son of Ronjat (54), *e.g.*, acquired the German initial *pf*

[24] *E.g.*, in Tungus (cf. A. Gorcevskij in *Sov. Sever*, I (1938), 105ff.
[25] Grégoire observes for children who are almost two years old: "The *s*'s were often lisped. These defective *s*'s cannot be considered as attempts at imitating *ʃ* or *ʒ*, since they were found in words where they replaced neither *ʃ* nor *ʒ*. The *s* must have sufficed to express both the hissing and hushing fricatives, since the incorrect articulation of *s* was close to that of *ʃ*. It was necessary to wait until the articulation would be decided in favor of the two normal types" (β 205). Cf. the lisped character of the Danish *s*, to which no back sibilant phoneme is opposed.

only in his twenty-first month, whereas he had acquired initial *f* three months earlier. In the same chronological order, although later, the same phonemes appeared medially: *f* in his twenty-third month and *pf* in his thirtieth month. Similarly, the opposition of a stop and an affricate in the languages of the world implies the presence of a fricative of the same series (the pair *t-ts* implies the co-existence of the phoneme *s*, etc.). The number of such affricates in a phonemic system is therefore never greater, and is generally less, than the number of fricatives. Before the child acquires affricates, he substitutes either corresponding stops or fricatives for them, *e.g.*, *t* or *s* for *ts*, and *p* or *f* for *pf*.

An opposition of two vowels of the same degree of aperture is not acquired by the child as long as a corresponding vocalic opposition of a narrower degree of aperture is lacking. Only if y is opposed to *u* can *ø* arise, etc., as *e.g.*, in French, Scandinavian or German children. Correspondingly, in the vowel systems of child language the wider degrees of aperture are never represented by more phonemes than are the narrower degrees of aperture (cf. Trubetzkoy *op. cit.*, 88, 103). The phoneme *æ*, to which *a* as the palatal opposition of the same degree of aperture and *e* as the narrow opposition of the same series are opposed, appears relatively later in children, and is explained by the laws of solidarity already mentioned. Sully remarks that English *æ* "appears to be learned only after considerable practice" (126); similarly Saareste reports the difficulties which the same phoneme affords Estonian children, who usually replace it with *e* (20), and this is also the case with *æ* in Slovakian children.

A differentiation of rounded vowels according to degree of aperture cannot arise in child language as long as the same opposition is lacking for the unrounded vowels. The pair *u* ~ *o* cannot, therefore, precede the pair *i* ~ *e*, and there are no children who have an *o*-phoneme without having acquired an *e*-phoneme. On the contrary *o* is very often acquired considerably later than *e*.[26] Accordingly, a number of languages have an *e*-phoneme without any *o*-phoneme (cf. Trubetzkoy *op. cit.*, 98 on the Lezghian vowel system), but there is hardly any language with *o* and not *e*.

[26] See *e.g.*, Aleksandrov 92f., Pavlović 48, Brenstiern 291, Ronjat 54.

Rounded palatal vowels, which Rousselot characterized appropriately as "secondary", arise in child language only after the corresponding primary vowels, *i.e.*, after the rounded velar vowels and after the unrounded palatal vowels of the same degree of aperture. This is the case, *e.g.*, with Dutch and French children, and both sons of Grégoire "acquired them completely only after much practice that continued beyond the second year" (β 245). The existence of a secondary vowel in the languages of the world is dependent on the co-existence of the two corresponding primary vowels. Thus, *e.g.*, the vowel *ø* does not occur in a linguistic system as long as the vowels *o* and *e* are not present in the same system (cf. Trubetzkoy *op. cit.*, 102ff.).

15. LATE OR RARE PHONOLOGICAL ACQUISITIONS

Oppositions which occur in the languages of the world comparatively rarely are among the latest phonological acquisitions of the child. Thus, the geographical distribution of nasal vowels is relatively limited,[27] and, accordingly, these phonemes appear, in French and Polish children, *e.g.*, only after all of the remaining vowels have been acquired, generally not until about the third year.[28] On the other hand, nasal consonants, as we have stated, exist in all languages and are among the earliest linguistic acquisitions of the child.

The number of languages with a single liquid (whether *l* or *r*) is extraordinarily large, and in this connection Benveniste justly points out that the child has only a single liquid for a long time and acquires the other liquid only as one of his last speech sounds.[29]

[27] See A. Isačenko, "A propos des voyelles nasales", *Bull. Soc. Ling.*, XXXVIII (1937).

[28] See *e.g.* for French, Grégoire 246f., Ronjat 54 and for Polish, Oltuszewski 23ff., Brenstiern 292.

[29] *Trav. du Cercle Ling. de Prague*, VIII (1939), 34f. Cf. similar observations in Egger 71 and Fröschels 105. Most descriptions report the very late adoption of the second liquid in child language. See *e.g.*, the characteristic example of a five-year-old in Barbelenet: "this child neither understands nor pronounces *r*; he always substitutes *l* for it" (34ff.).

The Czech *ř*, a sibilant opposition to *r*,[30] is one of the rarest phonemes that occur in language, and hardly any other phoneme of their native language presents such major and persistent difficulties to Czech children. It is also characteristic that Czech settlers in Russia easily loose this sound, as Prof. O. Hujer observed (the voiced combinatory variant becomes *ʒ*, the voiceless *ʃ*).

16. RELATIVE DEGREE OF SOUND UTILIZATION

The laws of irreversible solidarity determine the inventory of phonemic systems. In addition, the relative degree of utilization of particular phonemes in language (i.e., the relative frequency of their occurrence as well as their combinatorial capacity)[31] is also affected by these laws, provided that their validity is not restricted by specific structural principles. When, therefore, both phonemes — the implying as well as the implied — are introduced into child language, the implying element generally appears in speech more frequently than the other, takes part in a greater number of phoneme combinations, and possesses a more active assimilating force. Thus, in the sons of Grégoire, the predominance of the phoneme *a* is still observable even after the development of the vowel system, "a predominance which still lasts and against which the other vowels must struggle" (β 171). As has been observed in Russian children, fricatives, even after they have become a part of the phonemic system, are still used less frequently than stops. In consonant clusters, the former are omitted more easily and for a longer period than the latter, and non-contiguous assimilation changes fricatives into stops rather than the reverse (see esp. Gvozdov, Rybnikov). Similarly, studies of regressive assimilation in the language of German children show

[30] Cf. J. Chlumský, "Une variété peu connue de l'*R* Linguale", *Rev. de Phonét*, I (1911).
[31] Cf. the pioneering programmatic paper of V. Mathesius, "Zum Problem der Belastungs- und Kombinationsfähigkeit der Phoneme", *Trav. du Cercle Ling. de Prague*, IV (1931).

that velars are commonly replaced by dentals (Meumann), and that "the labial quality stands out as the most important" (Röttger).

17. PANCHRONY OF THE LAWS OF SOLIDARITY

One could easily increase the number of parallels between the phonological development of child language and the general laws which are brought to light by the synchrony of all of the languages of the world, and more extensive agreements will surely be uncovered as soon as more accurate information on child language from a great many different linguistic areas is obtained. Nevertheless, that such laws of irreversible solidarity exist in language can be considered as already established. Indeed, the domain of these laws is even considerably wider.

As we have said, the analysis of the most varied languages reveals general synchronic laws of solidarity. According to these laws, a secondary value cannot exist in a linguistic system without the corresponding primary value. From this fact two consequences necessarily emerge for the evolution of any given linguistic system as well: without the primary value, the corresponding secondary value cannot arise in a linguistic system, and without the secondary value, the corresponding primary value cannot be eliminated. Thus, the laws of solidarity turn out to be panchronic. They retain their validity at every stage and in the course of every change of all of the languages of the world.

18. LAWS OF SOLIDARITY AND SPEECH PATHOLOGY

The same laws determine, as we have seen (§ 14f.), the development of child language (*i.e.*, the building up of every individual linguistic competence): the acquisition of the secondary value presupposes the acquisition of the primary value. In addition, the dissolution of the individual linguistic competence is governed by the same regularity: the loss of the primary value presupposes the loss of the secondary value. "Close analogies between immature child language and

aphasia" (Fröschels β 49), or, more exactly, the infantilism or puelerism of aphasic speech, have repeatedly been pointed out.[32] The question of the parallels between the two areas, especially with reference to sound correspondences, requires a systematic survey.

The speech of dysarthritics suffers only to the extent that their speech apparatus suffers, and it does not reveal any constant sequence of mutilations: "if the lips are damaged the labials are affected, etc." (Liepmann α 489). Similarly, there is no permanent and uniform sequence of babbling sounds in the speech of the infant (cf. § 8). On the other hand, aphasic sound disturbances exhibit a strictly regular sequence of stages, and are therefore similar to those found in the actual linguistic progress of the child. Every attempt to make use of the principle of least effort already discussed (cf. § 5), or of any other mechanistic explanations, fails in this area.

The dissolution of the linguistic sound system in aphasics provides an exact mirror-image of the phonological development in child language. Thus, *e.g.*, the distinction of the liquids *r* and *l* is a very late acquisition of child language, and, as Fröschels observes, it is one of the earliest and most common losses in aphasic sound disturbances.[33] Also, in the restitution of language the "*r-l* symptom" often remains as the last distinct sign of an aphasic. Similarly, in those aphasics whose speech contained a uvular *r*, the confusions of the two liquids is characteristically almost a standard phenomenon (β 97f.), which once again confirms the insignificance of the place of articulation as far as the liquids are concerned.[34] The very late emergence of the sibilant *ř* in Czech child language is one of the most typical and well-known phenomena of Czech speech pathology (cf. Hlaváček, Kutvirtová). The nasal sounds, which in French children appear only after all of the

[32] In addition to Fröschels α, β, see *e.g.*, Feyeux 163, Head I, 221ff., Ombredane 409f., Pick γ, Torp 45f.

[33] For examples, cf. Ombredane (α 947) for French, Torp (37) for Norwegian, V. Bogorodickij (*Fonetika russkogo jazyka v svete èksperimental'nyx dannyx*, Kazan, 1930, 337) for Russian, Pick (δ 237) for Czech.

[34] Cf. esp. the paper of M. Dłuska, "Quelques problèmes de phonétique en polonais etudiés expérimentalement", *Archivum Neophilologicum*, I (1934).

other vowels, usually disappear earliest in French aphasics, as Ombredane states (α 955, β 468). English children acquire the interdental fricatives only after the corresponding *s*-sounds (cf. *e.g.*, Lewis 178), and, according to Head's statements, English aphasics loose the interdentals earlier than the *s*-sounds (*e.g.*, I 175, II 199f.). In the intervening period both children and aphasics replace the interdentals with *s*-sounds (*zis* "this", etc.).

In aphasics, secondary vowels are lost earlier than primary vowels; affricates are given up "in a childlike fashion";[35] fricatives then fall together, as in children, with the corresponding stops. Thus Bouman and Grünbaum report, concerning Dutch aphasics, that "an explosive sound is uttered in place of a spirant. The reverse confusion does not occur" (328).[36] According to the observations of Ombredane (α 947, β 408), *f* in French aphasics becomes *p* (*pu* "fou"), *s* becomes *t*, and *ʃ* becomes *k* (*ka* "chat", cf. § 14), if this latter change does not precede that of *ʃ* to *s* (see below).

Forward articulated consonants are more resistant than palato-velar sounds, and the latter become dentals for the most part, for which phenomenon there are again exact correspondences in child language. Nasal palato-velar sounds generally merge with *n* (velar *ŋ* in English as well as French and Czech *ɲ*),[37] and a parallel change occurs in fricatives and affricates, to the extent that these sounds are not yet eliminated. To this category belong the change of *ʃ*, *ʒ*, *tʃ* to *s*, *z*, *ts* in Czech aphasics, which was characterized by Haskovic as "infantile". And, finally, the back oral stops, as is well known, become *t* and *d*, or else the difference between *k*, *g* and *t*, *d* is preserved, but *k*, *g* are changed to the glottal stop, which, from the point of view of the phonemic system, subsumes only the distinctive feature of closure (or explosion) and consequently functions as an "indeterminate stop phoneme".[38]

[35] See *e.g.*, Kleist γ 805, 809, Ombredane 948.

[36] Similarly Bogorodickij, *ibid.*, on Russian patients.

[37] See Head I, 200, Ombredane α 948, Haškovec 595.

[38] On the last change see Fröschels β 77; for the change of velar stops to dentals, Gutzmann gives German examples ε 170, 260, Head gives English examples II, 199f., and Pick gives Czech examples δ 337.

A further impoverishment of the consonantal system results in the so-called "Paradeltazismus", *i.e.*, the merger of dentals and labials into a single series, which is represented for the most part by labial sounds. Labial consonants and the vowel *a* appear to be the last sounds to resist the process of dissolution (cf. *e.g.*, Gutzmann ε 232), and this stage corresponds to the beginning stages of child language. Indeed, the agreement goes even further. For, even after the complete loss of the inventory of speech sounds, the interjectional language ("emotional language") of the aphasic can be spared, as Hughlings Jackson understood and stressed (cf. *e.g.*, Kussmaul 59ff.). In short, the higher strata are always abolished before the lower.

The order in which speech sounds are restored in the aphasic during the process of recovery corresponds directly to the development of child language. Prof. B. I. Jacobowsky, Director of the University Psychiatric Clinic in Uppsala, has drawn my attention to the rapid (approximately half an hour) course of development from speechlessness through aphasia to the complete recovery of language in the awakening process of mentally diseased patients who have been treated with insulin.[39] Thanks to the kind cooperation of Prof. Jacobowsky, I was able to observe that there are processes, similar to an accelerated film (cf. § 12), which are extraordinarily valuable for the study of the acquisition of speech sounds and which must be systematically observed and examined. A schizophrenic in the process of awakening at first omitted the liquids in the pronunciation of his name "Karlson", and for a while initial *k* could not be restored and was replaced by the glottal stop. For a considerable period the rounded palatal vowels, and in particular *r*, were omitted by Swedish insulin patients; the lack of aspiration in the unvoiced stops was also striking (cf. § 2), as was the strong palatalization of *t* (cf. § 25).

19. NORMAL SPEECH DISTURBANCES

The dissolution of particular linguistic components is also not

[39] Cf. M. Sakel, *Neue Behandlungsmethode der Schizophrenie* (Vienna, 1935).

completely unknown in healthy adults under certain circumstances. Hence there are normal speech disturbances in addition to pathological ones.

Kraepelin observed an extensive similarity between the common speech disturbances in dreaming and aphasic symptoms (77ff.), and he also considered the connections between child language and dream language worthy of investigation (57ff.). But he is of the opinion that "real difficulties of sound production", those of fundamental importance in children and in motor aphasics, ought not to arise at all in dream language: "It is true that, when, in vivid dreaming, (our) utterances once exceed the domain of inner speech and become audible, actual words sometimes appear which, for the most part, are uttered as interjectional forms; but sometimes only unarticulated sounds occur. In the psychomotor area, therefore, obstacles exist which complicate or render impossible, not the conceptualization of speech articulations, but their conversion into sounds" (73). The assumption, however, that the sound inventory of inner speech remains intact in dreams is hardly correct. Not only the words actually uttered by the dreamer, but also "the introspectively graspable non-motor speech" which is only dreamed, can be subject to certain sound mutilations. I have observed this phenomenon several times in my own dream language. The alarm clock recently interrupted my sleep, in which I dreamed of having said *seme*. As I awoke, I was positive that this stood for *zemřel* "dead". (I now generally dream in Czech.) This is a typical manifestation of partial sound-muteness — the liquids have dropped, and the voiced consonants have become devoiced, as is customary in aphasics (cf. Ombredane β 408).[40] Sometimes the dreamer is directly aware of his own sound-muteness, which functions consequently as a dream motif.

The relative difficulty in establishing the sound mutilations of

[40] As an example of the role of homonymy in dreams, Mayer quotes a dream communicated to him "which concerns an aeroplane *Ente*, a dirigible in *England*, and finally *Ende*" (96). Presumably, the opposition of voicing and voicelessness was suspended for the dreamer, and the words *Ente-Ende* thus became homonymous, and perhaps the word *England* as well. One can assume that the velar became a dental and that the *l* was dropped.

dream language (or the denial of such sound disturbances) is based on two factors. As the dreamer awakes, the full word, which in dreams is replaced by a mutilated substitute, drives away the latter and automatically assumes its place in the dreamer's memory. Even Kraepelin admits that the dreams which one recalls most easily, and which one also follows and investigates most often, occur at "surely no great depth of sleep", (97), whereas aphasia progresses as one approaches deep dreaming, and the sound disturbances come to light only in deeper layers.

Whenever a word, and especially a name, is, so to speak, on the tip of one's tongue without his being able to recall its exact sound inventory, phenomena reminiscent of aphasia appear. On the one hand, a gliding into homophonous and synonymous words easily arises, and on the other hand, just as in aphasic sound disturbances, phonemic combinations are simplified and phonemic distinctions are suspended. Fluctuations occur, *e.g.*, between the two liquids, *ʃ*-sounds and *s*-sounds, and, generally, between palato-velar and dental sounds, between voiced and voiceless consonants, and between fricative and stop sounds (for the most part in favor of the latter), whereas such distinctions as those of dentals and labials, of nasal and oral consonants, or of narrow and wide vowels are considerably more stable and more firmly imprinted. And, just as in word-deafness, where the number of syllables in a word is often grasped even when the vowels or consonants are no longer distinguished, it is frequently the case that only the number of syllables of the forgotten word is remembered.

20. UNIFORMITY OF STRATIFICATION

The development of child language, the dissolution of aphasic language, and the synchrony and diachrony of the languages of the world all exhibit a sequence of common laws of solidarity. These laws attest to the step-by-step development of the linguistic system, and in particular of the phonemic system, and their universality establishes the fixed nature inherent in their order of precedence.

This system is by its very nature closely related to those stratified phenomena which modern psychology uncovers in the different areas of the realm of the mind. Development proceeds "from an undifferentiated original condition to a greater and greater differentiation and separation".[41] New additions are superimposed on earlier ones, and dissolution begins with the higher strata, as Hughlings Jackson has made known in his law dealing with retrogression from the more complex to the more simple and original. In accordance with this pioneer of modern neurology, Pick (see especially α 53) and Fröschels (see β 49) assume the stratified disintegration and formation of language. It has been our intention to examine this hypothesis, determine the stratification of different linguistic components, and to relate individual linguistic competence to the structural principles of the lanquages of the world.

It is true that certain parallels between the phonological competence of the child and several so-called primitive peoples have been pointed out before now, but for the most part one has been misled by the doubtful equation that "child language is to fully developed language as the language of primitive peoples is to that of civilized peoples".[42] Appeal has been made especially to the biogenetic law of Häckel, according to which every individual passes through the evolution of the species in an abridged manner: ontogeny recapitulates phylogeny. This widespread point of view has also left distinct traces in Stern's handbook. In the first place, however, with respect to the absence of certain phonemes (or with respect to the character of the defective classes of phoneme), not only "primitive languages", but "civilized languages" as well, correspond to the beginning stages of child language. Thus, as far as the "secondary" vowels are concerned (cf. § 14), Italian or Russian is related to Ostyak-Samoyed in the same way that French child language is to the fully-developed French language. The German affricate-less child language stands in the same relation to German,

[41] See E. Jaensch, "Über Schichtenstruktur und Entwicklungsgeschichte der psycho-physichen Organisation", *Zeitschr. f. Psychol.*, CVI (1928), 457ff.
[42] Stern 313; this thesis — already suggested by Taine — was maintained most emphatically by Gutzmann (β, γ).

with its affricates, that French does to the South African Chuana language. Compare the absence of back nasal consonants in Latin or Russian with the similar phenomenon in children and aphasics on the one hand, and, on the other hand, with the four nasals of Giljak (*m*, *n*, *ŋ*, *ɲ*). Secondly, the phonological deficiency of a given language need not point to an original poverty, but can also be a secondary impoverishment. Comparative linguistic research, in fact, often uncovers the recent origin of this impoverishment. According to the findings of historical dialectology, such is the case, *e.g.*, with the loss of velar consonants in Kasimov-Tatar, and also, as Wundt (313f.) correctly argued against Gutzmann, with the similar phenomenon in certain Austronesian languages (cf. § 14). In this case, and indeed in all parallels between child language (or aphasia) and the languages of the world, what is most conclusive is the identity of the structural laws which determines always and everywhere what does or will exist in the language of the individual and in the language of the society. In other words, the same hierarchy of values always underlies every increase and loss within any given phonological system.

III

FOUNDATION OF THE STRUCTURAL LAWS

21. ATOMISTIC ATTEMPTS AT EXPLANATION

The stratification of components in a phonemic system proves to be strictly regular. These laws can be explained, however, only by considering and demonstrating their inner necessity. All attempts at atomistic interpretation, which necessarily explain only one aspect or a single phenomenon and are therefore never comprehensive, are clearly inadequate. Thus, the phonological laws of child language are not to be mechanically separated from the corresponding evidence of the languages of the world and of aphasia, and the appearance of single sounds must not be treated in an isolated fashion without regard for their place in the sound system.

It was observed long ago, *e.g.*, that labials and, generally, front consonants appear earlier than velars in child language, and it has frequently been supposed that the reason for this lies in the habitual sucking motions practiced by children.[1] The other manifestations of the same sequence, however, must still be taken into account: why, *e.g.*, have palato-velar sounds been lost in many Austronesian or Tataric languages? Even the most extreme Freudian will hardly want to maintain that the recollection of infantile sucking motions has also played a part in these cases. Neither the abovementioned sucking hypothesis nor the equally familiar references to the very great visual prominence of front articulations[2] can explain the

[1] Thus already Sigismund and Preyer; see in addition Meumann α 19, α 18, Delacroix β 62.
[2] Thus *e.g.*, Passy, *Étude sur les changements phonétiques*, 21, Wundt 315f., Meumann α 19.

earliest, most permanent and stable consonantal opposition of child language — the distinction of nasal and oral labial sounds — inasmuch as the distinction between these two articulations remains inaccessible to the eye[3] and hardly plays any noteworthy role in sucking. And, finally, it is to be stressed that the babbling period, which belongs precisely to the period of sucking and which accentuates especially the motor aspect of speech, is rich rather in different kinds of velars than in front sounds.[4] It is unfortunately disregarded that in every linguistic system, including that of the child, what is important is not single sounds but sound distinctions, and therefore primarily the relation of every sound to all of the remaining sounds of the system.

22. INHERENT DIRECTION OF DEVELOPMENT

Only in the light of an inherently linguistic and comprehensive procedure does the sequence of stages of phonemic systems turn out to be meaningful and rigorously consistent. This sequence obeys the principle of maximal contrast and proceeds from the simple and undifferentiated to the stratified and differentiated. Let us attempt for the present to sketch the basic lines of this sequence, above all of the construction of the minimal consonantal and vocalic systems.

23. SPLIT CONSONANT∾VOWEL

The babbling period is introduced in the child by the so-called "cooing period": the tongue maintains approximately its normal position, and indeterminate neutral sounds are produced. These

[3] Cf. Jespersen 18f., H. Gutzmann (Kafka, *Handb. d. vergl. Psychol.*, Munch., II, 1922), 21.
[4] See esp. Brenstiern Pfanhauser 289. In this connection Prof. J. Lotz has drawn my attention to the onomotopoetic root *gagy-* or *gügy-*, which in Hungarian characterizes the babbling period of infants; cf. also the German expression "Krähen" (Ronjat 38).

sounds are usually described by observers as neither vowels nor consonants, or in other words, as both at the same time.[5]



Fig. II. Position of the mouth for *a* and *m*.

The first stage of child language begins with a clear distinction and delimitation of consonant and vowel. This same contrast can still be recognized in aphasics when the remaining sound distinctions have already been lost. From the motor point of view, these two fundamental classes of speech sounds are contrasted with each other as closure and opening.[6] The optimal opening is achieved in the wide *a*-vowel, while among the stop consonants it is the labial sounds which obstruct the entire oral cavity.[7] One might postulate that just this most simple and maximal contrast is qualified to inaugurate the distinction between the vocalic and consonantal systems at the threshold of child language, and in fact this hypothesis is confirmed by experience.

Voicing must be considered as an accompanying feature of vowels and can be absent only optionally. With the emergence of the contrast vowel

[5] Grégoire has devoted an interesting separate study to these sounds (α); cf. also *idem* β 30ff., Oltuszewski 20, van Ginneken 6, Hoyer 366f.
[6] Cf. *e.g.* de Saussure *op. cit.*, 70ff., Sütterlin, *Die Lehre von der Lautbildung* (Leipz., 1908), 105ff., Trubetzkoy, *op. cit.*, 83f.
[7] See *Figure II*, taken from A. Sovijärvi, *Die gehaltenen, geflüsterten und gesungenen Vokale und Nasale der finnischen Sprache* (Helsinki, 1938), Table I. Cf. the Russian onomatopoetic words for grasping and eating, *i.e.*, for the strong opening and closing of the fist, mouth and jay — *ap*, *am*, also *hap*, *ham*, or, adapted to the Russian phonological and grammatical system, *xap*, *xapat'*, *xapkij* and *xam*, *xamat'*, *xamka*, *xamkat'*.

~ consonant, the opposed feature of voicelessness stands out as a concomitant feature of the latter. The consonant is generally voiceless in the beginning stage of child language, and loses its voicing in partial sound-muteness (see Ombredane β 407f.). In partial sound-dumbness the voiceless rather than the voiced consonants are recognized (see *e.g.*, Freund 66, 76, 89). Similarly, in the languages of the world in which there is no phonemic opposition of voice vs. voicelessness, either only voiceless consonants occur or, at least, the voiceless consonants function as basic variants (*e.g.*, in Ostjak). If one considers the contrast of consonant and vowel, the replacement of voiced consonants by voiceless ones loses the disturbing character pointed out by Grégoire: "It would be simpler to conserve the voicing of the intervocalic consonant in a word like "oiseau", "noisette", etc. To suppress it would require interrupting the activity of the vocal cords, which vibrate during the vowel preceding the consonant as well as the vowel following it. One would expect rather a generalization of the voiced consonants, at least in intervocalic position" (β 206ff.). The attempt to explain by means of their strength this preference for voiceless sounds, which Grégoire (208) connects with the "vivacity and energy" of the child's utterances, and which Ombredane connects with the "great articulatory exertions" of the patient, is not convincing. Neither the analogous tendency observed in those languages without voiced ~ voiceless oppositions, nor the replacement of aspirated stops by weaker unaspirated stops in Scandinavian children (see § 2) and patients (see § 18) can be explained in this way.

What is the nature of the initial relation between consonant and vowel? Speech sounds (or other linguistic values) can be related to each other in two different ways. Let us compare the German words *blau* and *flau*. Between *b* and *f* there exists a relation of substitution, and between each of these sounds and the following *l* a contextual relation. The latter relation is called syntagmatic (see de Saussure *op. cit.*, 170ff.), and the relation between elements of one and the same series of alternations is called associative, or, following the more exact term of Hjelmslev, paradigmatic.[8] The syntagmatic relation arises in the child before the paradigmatic relation — the successive contrast before the simultaneous one, and the contrast between consonant and vowel arises, of course, on the syntagmatic axis.[9]

[8] *Actes du IV. Congr. Int. de Ling.*, 140.
[9] This agrees with the observation of Katz, according to which "the perception of movements is anterior, from the point of view of evolution, to that of the forms in rest" (*op. cit.*, 458).

The labial stop combined with the *a*-sound creates the model of the syllable. The phonemic framework is thereby provided, and a phonemic content is required in turn. Indeed, as Bröndal correctly stresses, "there is no framework or emptiness except in relation to the content or fullness".[10] The paradigmatic axis must be constructed: the function of distinguishing meanings cannot be carried out by speech sounds as long as a series of alternations does not arise.

24. OPPOSITION NASAL-ORAL IN CONSONANTS AND VOWELS

Stop and vowel, or in other words, obstructed connecting cavity and open connecting cavity, alternate within the syllable. The innovation that is subsequently added is the first paradigmatic opposition — that of the oral and nasal stop. While the vowel continues to be clearly characterized by the absence of an obstructed cavity, the consonant is split into two autonomous entities. The first is characterized by a single obstructed cavity, whereas the second includes an open subsidiary cavity in addition to the obstructed cavity, *i.e.*, the open nasal cavity is joined to the obstructed oral cavity, and thereby combines the specific characteristics of the stop sound and the vowel. This synthesis follows naturally the contrast consonant ~ vowel.

On the other hand, a nasal vowel, which opposes a double open cavity to the simple open cavity of the oral vowel and thereby simply increases the vowel quality, is a much more complicated and much less opposing entity. It is precisely for this reason that nasal vowels (*i.e.* speech sounds with double opening), like the so-called ejective or glottalized consonants (*i.e.* consonants with double obstruction), appear relatively rarely in the languages of the world and relatively late in the children destined to speak these languages,[11]

[10] *Journ. de Psychol.*, XXV (1938), 163.
[11] See E. Sapir, *Language* (New York, 1939), 212, Trubetzkoy, *op. cit.*, 139ff. and for child language, Kroeber 532.

while the universal opposition of oral and nasal consonants are at the same time the first paradigmatic opposition in child language and the most resistant in aphasia. In child language this is, as is known, the first phonological opposition which seeks to acquire a word-differentiating value.

The source of these linguistic entities lies in the prelinguistic expressive sound utterances. Two ways of expressing discontent have always been available to the child — the cry with a vocalic *a*-like oral opening, and the nasal murmer. This nasalization, Grégoire observes, accompanies expressions of dissatisfaction, crying and moaning; indeed, an *m* or *n* appears even without the characteristic explosion, "when the child, with his mouth closed, groans, by causing the voice to issue only from the nasal cavity, which sound the child is able to prolong" (β 45). According to Hoyer's detailed observations, the child's stop sound *m* is to be derived from this nasalizing, which is a characteristic of crying, except that a weaker expressive sound corresponds to the weaker emotion (380), just as generally the more calm emotions, which gradually also attain expression, are made known by means of a plosive sound (366). A revaluation thus takes place. It is no longer a question of the natural distinction between two instruments — of the oral and nasal cavity — but rather of the different utilization of the oral cavity, *i.e.*, of the opposition of the unobstructed vowel and the obstructed consonant, the latter then splitting into nasal and oral (more exactly, into simple and nasalized), depending on whether or not a nasal opening is joined to the oral obstruction.[12]

Nasalization is especially charged with emotion in the child, whereas obstruction in itself rather indicates weak emotion, or appeasement. It is thus easily understandable that the nasal consonant, in contrast to the

[12] As soon as the opposition of the oral and nasal stop has arisen, the "half nasal" disappears from the language of the child, where it sometimes occurs first as an optional variant of the stop — "[a] momentary noise whose acoustic effect is almost the same as that of our *m* without complete nasal articulation, or really *b* with a certain amount of nasalization" (Pavlović 25). The labio-lingual sound intermediate between *p* and *t* (which the child takes great pleasure in producing) is also eliminated in a similar way by means of the appearance of the additional opposition of labial and dental sounds in child language, and it is indicative of the importance of the above-mentioned opposition that it is absolutely foreign to the phonemic systems of the languages of the world and appears only in interjections (see Preyer 307, 312, Jespersen, *Fonetik*, Copenhagen, 1897-99, 189). It is true that half nasals occur in the languages of the world, but only in some of the exotic languages that do not tolerate consonant clusters.

oral (simple) stop, is active as a carrier of emotion in the beginning stage of child language, *i.e.*, as a complaining, demanding, calling sound of pain, and is also used to summon those "who are most frequently called upon to quiet the emotions of hunger and yearning: mother and nurse".[13] The oral stop, on the other hand, carries either less emotion or no emotion at all, and is not used for complaining, but for "drawing the attention, dismissing, refusing", and as a calmer, more apathetic designation, and thereby signals the real transition from emotional expression to symbolic language. Here is the only validity and linguistic substantiation of Stern's speculations on the "centripetal" nasal sounds and "centrifugal" oral sounds.

25. SPLITTING OF CONSONANTS INTO LABIALS AND DENTALS AND VOWELS INTO WIDE AND NARROW

In order to make clear the second consonantal split — the distinction of labials and dentals — we might survey briefly and concisely the fundamental discoveries of Köhler and Stumpf, which are unfortunately still insufficiently made use of in linguistics.[14] These two great scholars of modern acoustics deserve the credit of having uncovered and made precise two kinds of indissoluble qualities of speech sounds.

Like visual sensations, speech sounds are, on the one hand, light or dark, and, on the other hand, chromatic or achromatic in different degrees. As the chromatism (abundance of sound) decreases, the opposition of lightness and darkness becomes more marked. The more wide the vowels, the more chromatic they are, and therefore the less they are affected by the opposition light ~ dark. Of all the vowels, *a* possesses the greatest chromatism and is the least affected by the opposition light ~ dark, while the most narrow vowels, which are particularly subject to the latter opposition, show a minimally distinct chromatism. According to the

[13] See Stern 355ff. This interpretation is substantially confirmed by the observations of Preyer, Dyroff, Lewis and others.

[14] We refer to the two fundamental works — "Akustische Untersuchungen" by W. Köhler (*Zeitschr. f. Psychol.*, LIV, LVIII, LXIV, LXXII, 1919-1915) and *Die Sprachlaute* by C. Stumpf (Berlin, 1926), esp. to chapter 13 of this copious book — "Psychophysik der Sprachlaute".

penetrating analysis of Stumpf, two psychophysical processes — the U-I process, which is connected to the lightness and darkness of sound sensations, and the A process, which determines their degree of chromatism — correspond to the two coordinates of the vowel triangle mentioned above, that is, the base line U-I and the vertical line A (see fig. III). The first (which is reproduced below in fig. III by an unbroken line) turns out to be the basic process, whereas the second (which is illustrated by a dotted line) is accessory.

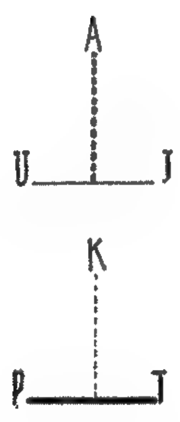


Fig. III. Principal co-ordinates of sound systems.

Certainly Stumpf knows that there are no languages where the vocalic systems are limited to the light ~ dark line, or to the basic process. He hesitatingly offers the hypothesis that in some pre-linguistic period "the ear of primitive man or his predecessors recognized only distinctions of pitch, or lightness" (339). But the problem is in no way solved by this arbitrary assumption. There are, in fact, languages with one-dimensional vowel systems, but the remarkable thing is that these linear systems in no way eliminate the vertical line, but rather the basic line of the triangle. Thus, as is known, both the vowel systems of the West Caucasian languages and the same kind of vowel systems in child language have no relevant distinctions of lightness and darkness (*i.e.* palatal and velar or unrounded and rounded vowels). These vowel systems are

limited to a phonemic distinction of three degrees of chromatism or a distinction of three degrees of opening (cf. § 13). Such facts appear to substantiate an untenable paradox: the basic process is inseparably bound to the accessory, while the accessory can indeed occur independently.

Nevertheless, this supposed contradiction is easily resolved by considering the vocalic and consonantal systems as two parts of one and the same whole, and by drawing the logical conclusions from Stumpf's clear definition of vowel and consonant, which he oddly enough neglected to do. According to this definition, the only correct one, vowels, in contrast to consonants, are characterized by their "pronounced chromatism". Incidentally, the relation between vowels and consonants is similar to the relation between the so-called spectral or variegated colours, on the one hand, and the hueless grey series, on the other hand (see *op. cit.*, 98ff.). The first opposition to appear — that of the two basic phonological classes (cf. § 23) — could therefore be justified on the grounds that it is a more elementary problem to perceive the distinctions between one class of perceptions and another than to perceive those within one and the same class of perceptions.[15]

Chromatism is the specific phenomenal feature of vowels, and *a* as the peak of chromatism is naturally the optimal vowel, to which the maximum quantity of the accessory process corresponds.[16] The A-line, which differentiates the degrees of chromatism, appears, accordingly, as the fundamental, primary, indeed sometimes even as the only axis of the vocalic system. Consonants are sounds "without pronounced chromatism", and since the opposition of

[15] Cf. C. Stumpf, "Über neuere Untersuchungen zur Tonlehre", *Bericht über den VI. Kongr. f. experim. Psychol.*, Leipzig, I (1914), 348.

[16] *Princeps vocalium*, as Hellwag, the discoverer of the vowel triangle, wrote (*De formatione loquelae*, 1781), and, according to the characterization of the famous philologist August Böckh, "the simple *a*, the root and stem of vowels ... and the first sound which children produce" (*Vom Übergänge der Buchstaben ineinander*, 1808). Stumpf's findings are confirmed also in the most recent analysis by F. Trendelenburg (*Klänge und Geräusche*, Berlin, 19, 35, 83f.). The dental, especially *s*-like concentration of very high frequencies was more than once referred to — cf. Köhler LXXII, 24ff., E. R. Haensch, "Die Natur der menschlichen Sprachlaute", *Zeitschr. f. Sinnes. physiol.*, XLVIII, 219.

light and dark — Stumpf's basic process — increases as the chromatism decreases, it naturally forms the primary, and occasionally the only, axis of the consonantal system. As acoustic analysis demonstrates, the labials oppose a dark quality to the light quality of the dentals. Since the quantity of the basic process increases, according to Stumpf, in the direction from light to dark (334), it is the labials that present the consonantal optimum.

A greater pitch corresponds to the phenomenal lightness (or sharpness) of the dentals (according to Stumpf, *p* = f^3, *t* = g^3-a^3; *f* = fis^3, *s* = a^3; *m* = dis^3, *n* = a^3) in contrast to the phenomenal darkness (or dullness) of the labials (cf. Köhler LXII, 72, 89, Röttger 107).[17] In addition, the fundamental pitch of the vowel adjacent to dentals is raised, while the fundamental pitch of the vowel adjacent to labials (and velars in contrast to palatals) is lowered.[18] In acoustical decomposition *i* changes to *u*, and *e* to *o* (Stumpf 105); and although it "appears far too paradoxical"

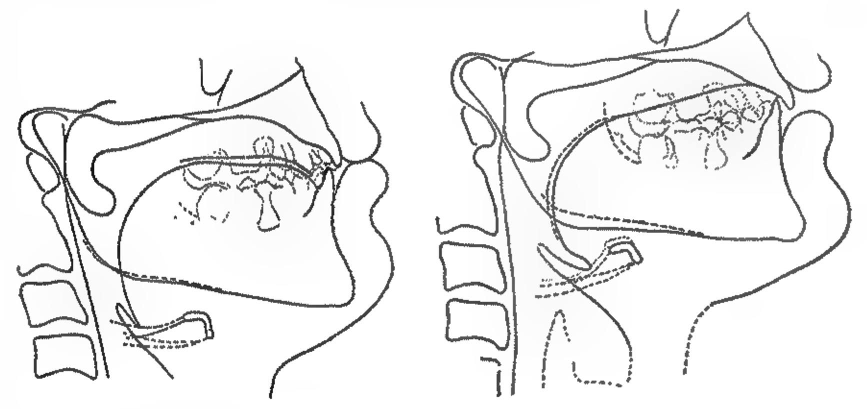


Fig. IV. X-Ray pictures of the pronunciation of *p* and *t*.

[17] See A. Thomson in *Idg. Forsch.*, XXIV, 8 and in *Arch. f. slav. Philol.*, XXXIV, 563.

[18] Often, also, a narrowing of the front opening of the oral resonator takes place in the labials: "The bundles of fibers of the inferior and adhering edges of the two lips, [which] pleat them by turning them outwards and projecting them forward. They control ... the labials *p*, *b*, *m* ... *f*, *v*, *w* as well as the vowels *u*, *o*, *œ*, *ü*, where the mentalis muscle can increase the pressure." (L'abbé Millet, *Étude expérimentale de la formation des voyelles*, Paris, 1938, 54). We are reminded of the well-known fact that both the lengthening of the resonator and the narrowing of one of its two openings deepens the sound (see *e.g.* H. Bouasse, *Tuyaux et résonateurs*, Paris, 1929, 120, 149).

to the surprised experimentor (124, 127), *s* merges with *f* (just as *f* becomes "more similar to *x*", 116) and *t* merges with *p* (115). Rousselot describes the interesting case of a person hard of hearing who distinguishes the degree of chromatism in the vowels and consonants as well as in the nasal and oral stops, but not their lightness or darkness: *e.g.*, *i* merges with *u* and *ü*, and accordingly *za* with *va*, and *da* with *ba* (*op. cit.*, 886). The dentals (and palatals) owe their lightness to an oral resonator which is divided into two shorter resonating chambers and to the widening of its back orifice (*i.e.*, of the pharynx), while the darkness of the labials (and also the velars) owe their darkness to a long, undivided oral resonator with a narrower back orifice. Thus, standard X-ray pictures of Czech sounds revealed the following: width of the pharynx in normal position — 13.3 mm; widening for *t* and *ts* = 0.5 mm, *s* – 6.3, *n* – 8.9 (*c* – 12.7, *ʃ* – 1.7, *ɲ* – 16.7 and similarly for light vowels, *i* – 15.2, *e* – 4.0); narrowing for *p* = 2.5, *f* – 4.7, *m* – 2.5 (*k* – 2.6, *x* – 3.8 and for the dark vowels *u* – 3.8, *o* – 5.5, *a* – 6.8).[19]

The following laws are thus explained all at once: the priority of the labial consonants and the *a*-vowel; the priority of the basic line in the consonantal system (reproduced by the thicker unbroken line

[19] See B. Polland and B. Hála, *Articulace českých zvuků v roentgenových obrazech* (Prague, 1926), and our *Figure IX*, which is reproduced from Tables 22 and 27 of this work. Accordingly, the distance of the epiglottis from the tongue is increased for all light vowels and oral and nasal stops and decreased for all dark vowels and stops. In spite of the stimulating observations of two famous Czech scholars of the last century, Purkyne and Czermák, the fundamental importance of the pharynx in sound production was neglected in the technical literature until a short time ago, and only the most recent investigations, especially those of Hála (*op. cit.*), R. Husson ("Étude théorique et éxperimentale de la réaction du résonateur pharyngien sur la vibration des cordes vocales pendant la phonation", *Rev. Franç. de Phoniatrie*, I, 1933), Millet (*op. cit.*), and Sovijärvi (*op. cit.*) have begun to examine these questions. Especially important conclusions can be drawn from the findings of the last-mentioned scholar, since he considers both the physiology and the acoustics of speech sounds. Again it becomes apparent that the "width of the pharynx" is greater in the formation of light sounds than it is for dark sounds. Accordingly, the light vowels have a higher oral formant, but a lower pharyngeal formant than the corresponding dark vowels (see 97ff.):

frequency of the pharynx	frequency of the oral cavity
a 880 - *æ* 860 ~	*a* 1100 - *æ* 1600 ~
o 530 - *e* 450 ~	*o* 800 - *e* 2100 ~
u 400 - *i* 330 ~	*u* 630 - *i* 2520 ~

This contradiction between two opposing factors is certainly a simple secondary phenomenon, while the real function of the widening or narrowing of the pharynx is to raise or lower the oral formant.

in our schema), *i.e.*, the priority of the split of oral and nasal consonants into labial and dental; and, in addition, the priority of the vertical line in the vocalic system (reproduced by the thicker dotted line in our schema), *i.e.* the priority of the distinction in vowels according to degree of aperture; and finally, the order in the splitting of the vowels into velar and palatal, *i.e.*, the order in the direction from narrow vowels to wide vowels.

The initial inclination of children to palatalize dentals can also be accounted for. Dentals are opposed to the dark labials by their distinct lightness, and since palatalization, *i.e.*, a flattening of the resonating area, intensifies the lightness of a consonant, the palatalized dental sound offers the optimal degree of lightness.[20] This explains the fact that Grégoire's one-year-old son, who "knows how to correctly produce the

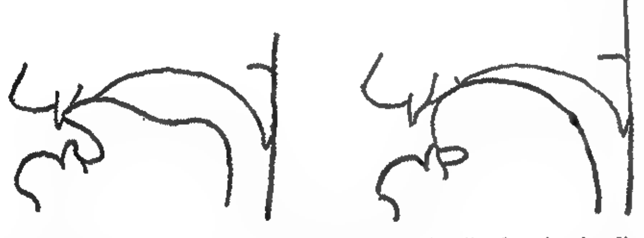


Fig. V. Profile of the oral resonator for non-palatalized and palatalized *t*.

dental stops of French", nevertheless shows a marked inclination for their palatalized variants (68). But since there are no palatalized consonants in his linguistic model, the French child abandons them early, while Russian, Polish or Japanese children cling to the palatalization more obstinately and consistently, since there is an opposition of palatalized and non-palatalized dentals in their native language. Thus, in his third year, the son of Blagoveščenskij still used exclusively the palatalized variety of dental sounds and the non-palatalized variety of labial sounds

[20] See *diagram* X (from S. C. Boyanus, *A manual of Russian Pronunciation*, London, 1935, 15). French examples in Grégoire 176, 244 (*bat'o* "bateau", *at'ɛ* "tante", *n'e* "nez"), Russian examples in Aleksandrov 4, 10, 14 f., Blagoveščenskij 76 (*t'at'* "tak", *d'om* "dom", *n'a' t'a* "naša", *s'am* "sam"), Polish examples in Brenstiern 290, 295 (not only with *n'*, *s'*, *ts'*, but also with *t'*, *d'*, which do not occur in Polish), Estonian examples in Saareste 15, Japanese in Ohwaki 86. Cf. the regular *t'a* "tack" of a one-year-old Swedish girl and the similar palatalized and unaspirated *t* in Swedish aphasics (see § 18).

(79). Words of the Russian and Japanese "nursery language", which in some cases have penetrated into the standard language, also present as a rule the palatalization of dentals (cf. *e.g.*, Russian *t'át'a* "father", *t'ót'a* "aunt", *tít'i* "nipples", *t'ut'ú* "hidden", *d'ád'a*, "uncle", *n'án'a* "nurse", *n'ún'a* "cry baby", *n'in'i* "forbidden"). In Northeast Jak, the palatalized stop *t'* occurs exclusively in words originating in the nursery language.[21]

In the development of child language, the first vocalic opposition arises only after the first consonantal opposition. There is thus a stage of development in which consonants already exercise a distinctive function, while the single vowel still functions merely as a supporting vowel and as a carrier of expressive variations.[22] One can summarize the development of sounds into elements which constitute meanings in the following manner: first the consonants appear, which split on the horizontal or black-white line. The vowels are then joined to these and are grouped along the vertical line according to degree of chromatism. The precedence of the basic process over the accessory A-process is thereby perfectly verified. The development of speech sounds occurs in the same sequence as the development of visual sensations: the so-called variegated colours of different degrees of chromatism are joined only later to the hueless black-white series.

26. SPLITTING OF CONSONANTS INTO FRONT AND BACK

Sounds without distinct chromatism present two different degrees of relative achromatism, as Stumpf indicated (100 f.). The two coordinates which are present in the vocalic system are also found in the consonantal system, but their hierarchical arrangement is different. The linear vowel system is reduced to the vertical line, and the linear consonantal system, to the base line. Among the consonants, the labials and dentals present the maximum achro-

[21] See W. Steinitz, "Xantyjskij (ostjackij) jazyk", *Jazyki i pis'mennost' narodov Severa*, I, 202.
[22] Cf. Grégoire β 77 ("a vowel can be isolated, prolonged, forced with intensity and modulated by means of different pitches"), 87, 11 and Hoyer 380.

matism, and the palato-velars, the minimum achromatism.[23] Palatovelars hold a place in the consonant system similar to that of the wide vowels within the vocalic system: they are both maximally distant "from the line of simple lightness" (cf. Stumpf 254), and they are also the least likely to split according to darkness and lightness into two separate classes. While the opposition between the light and dark front sounds, i.e. between dentals and labials, is nearly universal, the opposition between light and dark back sounds, *i.e.*, between palatals and velars, remains unknown to numerous languages, just as the corresponding opposition in the wide vowels is also frequently absent. The palato-velar sounds thus form the peak of the consonantal triangle. These sounds, as well as the peak vowels, have a higher resonance (or forcefulness) than the sounds of the respective base line (cf. Sütterlin *op. cit.*, 70).[24] Acoustic observations show that *ceteris paribus* wide vowels are superior in audibility to the narrow vowels, and, similarly, the back consonants, to the corresponding labials and dentals. According to Rousselot (*op. cit.*, 1963f.), the French consonants are distributed "in terms of comprehensibility" in the following manner:

$k = 1.25$		$g = 1$		$ʃ = 6$	
$p = 0.81$	$t = 1$	$b = 0.2$	$d = 0.45$	$f = 1.57$	$s = 1.66$

Similar results for American English (with an unclear deviation for *t*) are given in the thorough analysis by Harvey Fletcher.[25]

[23] A certain acoustic similarity between the narrow, minimally chromatic vowels and the back, minimally achromatic consonants manifests itself in the fact that, *e.g.*, "a dark, wide *Sch* is related to *U*, a *Ch* is related as a palatal to *I* ... but consonants with distinct *O*-, *A*-, *Ä*- character (and let us add front consonants with *U*- or *I*-character) will not be found" (Stumpf 100f.). On the other hand, any number of similar overtones nearly always" arise between the sounds of musical instruments and the wider vowels, while such correspondences occur only rarely for *u* and *i* (idem 400). One could perhaps mention, as a remote analogy to the acoustic characteristics of back consonants, the observations of Hering, according to which grey is much more easily changed to another colour than white or black (*Plügers Archiv* XLI, 11).

[24] J. Grimm already described *k* as "the fullest of all producible consonants" (*Deutsche Grammatik*, III, 1).

[25] *Speech and Hearing* (New York, 1929), 73 (!) *k* 84.6 — *p* 81, *t* 85.3 (!); *g* 84.9 — *b* 81.3, *d* 9314; *ʃ* 91.1 — *f* 80.7, *s* 80.3; *ŋ* 91.4 — *m* 85.3, *n* 86.75. Cf. the distribution of "phonetic power" (ebenda 74): *k* 13 — *p* 6, *t* 15 (!); *g* 15 —

But what is only a secondary phenomenon, or epiphenomenon of the vocalic chromatic oppositions is an essential characteristic of the palato-velar consonants. Stumpf carried out an acoustical decomposition of the sounds *k*, *t*, *p* by means of acoustic filters, and the results showed that, when *t* and *p* are on the point of disappearing, the velar stops still remain in the form of a "dry knocking noise" (114).[26] In this connection it is noteworthy that, in several languages with linear consonantal systems, and very often in the corresponding stage of child language and of aphasia, velars are similarly replaced by a glottal stop (cf. §§ 14, 18). The awareness of a certain relationship and homogeneousness of this glottal stop with velar stops manifesst itself, *e.g.*, in Czech popular rhymes: *kominík má flek, kominice ne* (*ne* "not" with expressive glottal stop).[27] Grammont states that "a velar stop is the normal substitution for a glottal stop in those languages which do not at present have laryngeal stops", and that the *u-u* of the cuckoo accordingly has become *'u'u* and then *kuku*.[28] One might also mention the child's *a'a'* "defecation, excrements ", which is adopted to the sound structure of such languages as Russian or French as *kaka* (cf. the onomatopoetic *h* in "notional" Russian, which changes to *x*) and then, as part of the nursery language, is naturally reproduced as *tata* by children beginning to speak (cf. § 12).

b 7, *d* 7; *ʃ* 80 — *f* 5, *s* 16; *ŋ* 73 — *m* 52, *n* 36. Incidentally, the pharynx is of significance not only for the basic line, but also for the vertical line of the vowel and consonant triangle. The wider the vowel, the shorter the width of the pharynx and the higher its formant (cf. p. 77). This shortening is obtained in part by the lower position of the soft palate and in part by the higher position of the glottis. The shortening of the width of the pharynx appears to turn up also in the back consonants, although with less regularity. In any case, a smaller width of the back resonance chamber (*i.e.*, of the chamber behind the most narrow point in the connecting tube) is characteristic both of wide vowels and of palato-velar consonants (cf. Millet *op. cit.*, 28).

[26] Also, *ŋ* turned out to be stronger than *m* and *n* (117). Cf. P. H. G. van Gilse: "For the labials and dentals the noise is less strong" ("La construction d'un langage sans larynx practicable", *Arch. Néerland. de Phonét. Exp.*, X, 139ff.).

[27] See H. Pedersen, "Den böhmiske Udtale", *Nordisk Tidsskrift for Filologi*, XI.

[28] *Traité de phonétique* (Paris, 1933), 378.

27. AGREEMENTS BETWEEN THE SYSTEMS OF SOUND AND COLOUR

It is possible to stay within the limits of phonological phenomena concerning the inquiry into sound qualities and to view the terms light-dark and chromatic-achromatic, as well as variegated or hueless colours, as simple metaphors and to replace them eventually with non-metaphorical terms; but the problem of the phenomenal similarity between sound and colour is becoming more and more evident (cf. esp. W. Köhler, LXXII, 181 ff.). Obviously, both series of qualities, lightness-darkness and chromatic-achromatic, are common to sound and visual sensations, and the structure of sound and colour systems shows marked agreements.[29]

Moreover, cases of pronounced coloured hearing, especially in children or retained from childhood, in which acoustic impressions and particularly speech sounds, "appear bound non-arbitrarily, regularly and consistently with the same colour experiences",[30] show the close connection of the vowels *o* and *u* with the specifically dark colours, and of *e* and *i*, on the other hand, with the specifically light colours. A distinct inclination to connect the more chromatic vowels with the variegated colours, especially *a* with red, and, conversely, the vowels *u* and *i* with the least variegated colours, or even with the black-white series, is also apparent in coloured hearing. There are cases known to me in which only the dark vowels (*e.g.*, in a twelve-year-old Swedish girl, only *u, o, å*) cause sensations of colours. Generally, associations with the dark vowels are apparently firmer and more compulsory than associations with the light vowels; and, on the other hand, associations with the U-I-line are firmer than associations with the A-line. In addition, characteristic and highly instructive confusions between these two co-ordinates occur in weaker degrees of coloured hearing, but not in "genuine" synoptists.

K. Langenbeck, who has had distinct colour-sensations for each vowel since he was a young child, and for whom these impressions "are manifested in an absolutely constant manner", may be considered as an example of a strongly developed "acoustic-chromatic synopsia". His system of colour associations is as follows:

[29] Thus the stimulating experimental investigations by K. Huber ("Vokalmischungen und Qualitätensystem der Vokale", *Bericht über den IX. Kongr. f. exper. Psychol.*, Jena, 1926), as well as the structural analysis of phonemic systems, show that in this area also a more pronounced "sudden transition from light to dark" takes place.

[30] Cf. Maria C. Bos, "Die echte und unechte audition colorée", *Zeitschr. f. Psychol.*, III (1929).

a red		*æ* rose
o blue	*ø* light blue	*e* yellow
u dark brown	*y* grey	*i* silver white[31]

From our own material we mention the vowel-colour system of S. P. (a Czech — 32 years old, very musical, and also gifted as a painter), who, since her childhood, has been able to call forth immediately a constant and clearly nuanced colour for each speech sound:

a red	
o blue-red	*e* light green
u dark blue	*i* canary yellow[32]

While all consonants remain colourless for Langenbeck, greyish-coloured sensation are generally bound up also with consonants for S. P.:

k graphite grey	*x* coffee colour	*c* yellow-grey	*tʃ* blue-white with some red	*ʃ* blue-silver colour
g dark grey	*ʎ* intensive cinnamon colour	*ɟ* blue-yellow		*ʒ* tin colour
		ɲ beige		
p dust dark	*f* violet	*t* light greyish	*ts* dark blue-white	*s* sharp tin colour
b grey-blue	*v* dull violet	*d* light orange		*z* grey-white
m grey-brown		*n* beige		

The opposition of all labials or velars, on the one hand, and all dentals or palatals on the other, was interpreted as an opposition of dark and light, and the velars and palatals appeared "more compact" than the

[31] *Zeitschr. f. Sinnesphysiologie*, (XLVII 1913), 162. It is noteworthy that even Langenbeck resorts to completely untenable explanations for his correlations. For example, "I explain the red of *a* by the fact that the first "W*a*gen" which I received as a children's play thing was red" (175). A nearly identical description is given by L. Deichmann: *u* dark brown, *o* red brown, *a* red, *e* yellow, *i* white (*Erregung secundärer Empfindungen im Gebiete des Sinnesorgane*, Med. Diss., Greifswald, 1889). Annelies Argelander has compiled photisms of many German test cases and maintains that "yellow (is predominant) for *e*, brown for *o*, black for *u*, white for *i*", and, for the velar or unrounded *a*, a vacillation between red and white and a dark colour (*Das Farbenhören und der synästhetische Factor der Wahrnehmung*, Jena, 1927, 68f.).

[32] Among vowels of foreign languages, *æ* was perceived as orange coloured, *ø* as grey-green-red, *y* as grey and *ɯ* as grey-brown.

labials and dentals. The colour of *l* was characterized as steel, that of *r* as blue-red (similar to *o*) and that of *ř* as even "more bluish".[33]

The development of the colour instinct (and its pathological disturbances) provides striking analogies to the development and dissolution of the phonological system. The preference for black and red at the stage of child development in which variegated colours are not yet distinguished brings to mind the beginning contrast of the bilabial stop and *a*. One may compare, in addition, the "agnosia for colours other than red, black and white" (see Kleist α 538) with the stage of the single, most achromatic vowel and the splitting of the consonants into labial and dental. Cases of partial colour blindness in which only red and blue of the variegated colours are still recognized (533) correspond to the linear vowel systems; and the system of variegated colours "blue-red-yellow" of common green-blindness (532) is similar to the basic vocalic triangle.

28. CLASSIFICATION AND THE STRUCTURE OF HIGHER UNITS

With the onset of the basic process — *i.e.*, with the distinction between labial and dental consonants and with the first manifestation of the accessory process — *i.e.*, the differentiation of vowels according to width and narrowness — essential stages of the linguistic structure are launched. The opposition of labials and dentals, which we have described as the second consonantal opposition (after oral ~ nasal) brings with it the separation of two linguistic units, one superordinated to the other: *distinctive quality*, on the one hand,[34] and the *phoneme* as a bundle of distinctive features, on the other hand.[35] In the child whose vocabulary is composed of *papa* and *mama*, every phoneme contains a single distinctive feature: *p* = oral, *m* = nasal. As soon as *tata* (and eventually also *nana*) appears, a co-occurrence[36] of two features

[33] A. Argelander has unfortunately limited herself to the vowels in her detailed, but linguistically unsatisfactory investigation of sound-colour correlations "inasmuch as the comparative material is for the most part [limited to vowel sounds]" (48).

[34] *Distinctive feature*, according to Bloomfield (*Language*, New York, 19-33, 77ff.).

[35] For a more exact definition of the phoneme, see my article in *Acta Ling.*, I (1939), 128.

[36] *Cumul*, in the terminology of the Geneva school; cf. my article in *Mélanges Bally* (Geneva, 1939), 151.

within a single phoneme arises (*e.g.*, *p* = oral + labial). But in a larger sense the principle "one phoneme, one word (or one sentence)" still applies, so that one can speak of a *p*-word, and *m*-word (or of a *p*-sentence or *m*-sentence), and so on. The vowel is merely a concomitant feature, and it is by means of syllable reduplication that the linguistic value of the sound or the independence of a linguistic unit is signalled in the beginning stages of child language.

By means of the differentiation of vowels according to their width and narrowness (*e.g.*, *papa-pipi*) *phoneme* and *word* become autonomous (*e.g.*, *papa* contains at this stage two phonemes — *p* and *a*). The syntagmatic axis of the word (*i.e.*, the sequence of its components) combines with the paradigmatic or meaning-differentiating axis. The richer the co-occurrence of distinctive features within the phoneme, and the sequence of phonemes in the word, the more the original ambiguity of the word recedes. As an example of initial rampant homonomy, cf. *avé* ("laver, lever, trouver"), *asé* ("casser, chercher, marcher, ramasser"), etc., mentioned by Bloch (β 704f.).[37] To the two differentiations mentioned above, an additional one is added: the principle "one word, one sentence" is abolished, and the sentence as a superordinated unity, and the word as an element of the sentence, are opposed to each other. Eventually there follows a splitting of the word into grammatical totality, on the one hand, and morpheme as a subordinated unit, on the other hand.

The number of distinctive features in the phoneme (or the number of phonemes in a phonemic system) and the maximum number of phonemes in the word, as well as the number of their possibilities of distribution and the maximal number of phonemic distinctions within a word, increases by degrees in child language (or decreases by degrees in aphasia), and this increase is aesthetically experienced and consequently practiced by the child. Elsa Köhler refers to the innumerable sound games which consist in the stringing together and modification of particular sound configurations: "The quality of the configuration is never changed by more than one, or at the utmost two, features", and this stringing together of only

[37] Leopold includes many instructive examples in the chapter "Vocabulary to the Age of Two" (30ff.).

partial similarities is continually the occasion of new surprises and pleasures." A characteristic example is *pupsi, pipsi, titsi, teitsi, fitsa, litsa, hitsa, totsa* .... (75f.).

In the beginning stage of child language only one sound can function distinctively within a given word. Usually the consonant changes, while the vowel (*a*) remains unchanged. Sometimes an additional vowel can also occur at this stage of monophonemic words, but only if it occurs alone (*i.e.* without adjoining consonant), *e.g.*, *pa-ma-ta-a-o-e* (see Oltuszewski 32). Concerning the next stage — that of biphonemic words, Preyer states: "Although *bi* and *te* are each reproduced in isolation by the child, he cannot combine both and turns away angrily when he must repeat *bi-te*. ... If I say *bi*, the child answers *bibi*, if I say *te* the answer is *tete*. If I say *bi-te*, then the answer is again *bibi*" (328, 330).

The distinctive sound units following each other in the word grow in number and diversity in successive stages. There are, however, additional possibilities: The child (or the aphasic) can use two different consonants or two different vowels in the same word. However, he cannot use both differences at the same time (*e.g.*, Russian *mat'a*, *t'ot'a*, but not *t'oma*), or at least the choice of the vocalic or consonantal differences tolerated within a word is restricted. When, *e.g.*, the first vowel of the word is palatal (or velar), the remaining vowels of the word retain the same quality in some children — cf. the vowel harmony of most of the Ural-Altaic languages (see Ross 508f.). Similarly, the initial consonant becomes devoiced if a voiceless consonant occurs medially (see Bloch β 697), so that a word must have either exclusively voiced or exclusively voiceless consonants. This same phenomenon was repeatedly observed in aphasics (cf. Torp 42f., 48f.).

We have attempted in the preceding paragraphs to reduce the phonemic systems of the languages of the world and the corresponding phenomena of child language and speech pathology to a common denominator. In the same way one could compare, on the one hand, the "shortenings and coarsenings of sound sequences" in children learning to speak and their step by step lengthenings and refinements, and, on the other hand, the similar kinds of aphasic disturbances — "sound sequence deafness and muteness"[38] — with the relevant typology of the languages of the world. In this way one could broach the question of uniform stratification in the study of sound combinations as well.

29. PLACE OF THE DENTALS IN THE CONSONANT SYSTEM

In the initial stage of child language, a bilabial stop as the single, optimal, consonant and an *a*-sound as the single, optimal, vowel are opposed to one another. They function, accordingly, as the starting point for the development of the consonantal and vocalic systems. An opposition is thus established within the two sub-systems — the maximally light stop and the minimally chromatic vowel. The two co-ordinates of the linguistic model are thereby projected by the child onto a single co-ordinate in both the vocalic and consonantal systems. In this way the palato-velar stops of the mother tongue become dentals and, very often, the palatal vowels become narrow vowels.

According to the attractive hypothesis proposed by Stumpf, "the quantity of the fundamental process increases with the increasing darkness of the sound (*i.e.*, the increasing wave length of the impulse)" (333f., cf. above § 25). Within the consonantal system, therefore, the dentals are to be viewed as the starting point of the opposition lightness ~ darkness (or dental ~ labial). If, nevertheless, the dental stop arises in the child only after the labial, this priority has its roots simply in the fact that the fundamental opposition of the optimal vowel and the optimal consonant furnishes the most pregnant phonological opposition. The dentals, however, become the natural foundation of the consonantal system in its subsequent autonomous development. Observers note a striking reversal, which brings with it the so-called "law of the preference for dentals".[39] "An almost sudden change takes place", says Grégoire (61) — the dentals prevail, and "(they) become more frequent than the labials". This phenomenon surprises the investigator: "There is no intrinsic reason which explains the privilege given to *t* and *d*. No significant reason weighs in favor of these sounds". These findings agree with those of M. Cohen: "The dental articulation gains ground on the labial" (114f.).

Several alleged anomalies can be explained without difficulty by this

[38] *I.e.*, the inability to comprehend and to conceptualize of plurality (cf. Kleist γ 706 f., 830).

[39] The expression is taken from Gutzmann (Kafka, *Handbuch* ..., 17f.).

reversal. De Saussure pointed out one of these: "Children often pronounce *t* for *k*, although our languages offer no corresponding phonetic change in their history" (*op. cit.*, 205). As long as it is essentially a question of an opposition of a labial and a non-labial phoneme, and the latter is represented by the polar opposed dental, it is natural that even *k* is merged with *t*. But as soon as this opposition is realized by the opposition darkness ~ lightness, the basis for identifying the velars with the dentals disappears, and, of the newly arising fricatives, the dark velars merge with the dark labials and the light palatals with the light dentals. Thus, in Russian children, "bog" (*box*) becomes *baf*, and "šiš" becomes *s′is′*. The change $k > t$, therefore, remains almost unknown to the languages of the world.

The lightness of the dentals is related to the darkness of the labials as an elementary to a complex feature, and consequently a new irreversible solidarity arises: the labial phoneme can neither arise nor continue without a corresponding dental phoneme. On the other hand, phonemic systems with *s*, but without *f*, are widespread. In the stops, the corresponding solidarity is reversible, since a consonantal opposition presupposes the opposition of the consonants and vowels, which in turn requires a labial consonant. Therefore, both the labial and dental stop belong to the minimal consonantal system. But as soon as (or as long as) the phoneme operates as a value subordinated to the word and superordinated to the distinctive feature (cf. § 28), the solidarity of the labials is dependent on the dentals, and the different order in the emergence of labials and dentals in stops and fricatives is explained.

Third, the question must be asked: why, in those languages which do not have any opposition of palatalized and non-palatalized dentals, does the dental consonant normally appear as unpalatalized, while in the beginning stage of child language it appears as palatalized? In addition, in those languages in which the opposition palatalized ~ non-palatalized occurs, the palatalized dental always functions as the unmarked member.[40] When, in the initial stage of child language, the opposition to the labial is formed, it is destined to contrast maximally with it, and palatalization is a clear manifestation of this tendency (cf. § 25). But as soon as the dentals become the founding components of the consonantal system and the labials correspondingly the founded, the former cannot have a more complex structure than the latter. Furthermore, since the palatalized consonants add a separate additional articulation to the basic articulation of the non-palatalized consonants and are, therefore, more complex than the latter, the non-palatalized dental becomes the sole (or at least the unmarked) representative of the dental phoneme.

[40] Cf. N. Trubetzkoy in *Trav. du Cercle Ling. de Prague*, IV (1931), 98f.

30. SECONDARY GRADATIONS OF PHONOLOGICAL OPPOSITIONS

The less structured units in the development of the phonemic system are replaced by more and more structured units, and, accordingly, all laws of solidarity are explained by the stratification of more simple and undifferentiated oppositions by more refined and differentiated ones. *E.g.*, the fundamental opposition between stops and vowels (*i.e.*, between complete closure and opening) naturally precedes the opposition between a complete closure and a partial, or looser closure (*i.e.*, the opposition of stop and fricative sounds).

The opposition of *u* (or *o*) and *i* (or *e*), *e.g.*, really contains two parallel distinctions: velar-palatal and rounded-unrounded. *Ceteris paribus* a rounded vowel is distinguished physiologically from the corresponding unrounded vowel only by the narrowing of the front orifice of the oral resonator, and the velar is distinguished from the corresponding palatal by the narrowing of the back orifice (cf. § 25), and by the uniform, undivided, and undiminished volume of the oral resonator. The vowel sound is thereby darkened by the rounding and by the velarity in different ways. The acoustic analysis of vowels by Stumpf shows that *ceteris paribus* an unrounded vowel, in contrast to a rounded vowel, has a higher second formant, and that the palatal vowel supplements the formant of the corresponding velar vowel with a higher formant.

The mutual autonomy of these two distinctions is effected by the combination of opposite features in a rounded palatal vowel, *e.g.*, *y* (or less frequently in an unrounded velar vowel, *e.g.*, *ɯ*), and it is necessarily a secondary acquisition, *i.e.*, indissolubly bound to the presence of the primary opposition *u* ~ *i*, and, therefore, lacking in a large number of languages.[41] Such contrasts as, *e.g.*, *t* ~ *s* and

[41] At first, only the combination of parallel phonological oppositions, or a single series of parallel oppositions, is relevant in child language. Thus, very often a system of four vowels is observed in children in which the opposition velar ~ palatal is common to the two pairs of vowels:

a	*e*
u	*i*

p ~ *f* also combine two parallel distinctions, namely, that of stop and fricative consonants and that of mellow and strident consonants. The strident consonant is opposed to the corresponding mellow consonant by means of a characteristic strident noise dispersal, which sounds like "cutting tones" to Stumpf (166). This is due to the fact that a stronger air column batters against a more complicated obstacle which generally is composed of hard components.[42] The independence of the opposition stop ~ fricative from that of mellow ~ strident is effected by the combination of opposite features in an affricate, *i.e.*, in a strident stop (*e.g. ts, pf*), and is, accordingly, secondary. The presence of mellow fricatives (*e.g.*, the interdental *θ* and the bilabial *φ*) also presupposes generally the presence of the corresponding strident fricatives.

The liquids are similar to the nasal consonants in that they add a vocalic opening to the consonantal closure, except that in the nasal consonants two cavities each perform a single function, while in the liquids the two opposing functions belong at the same time to one and the same cavity. A nasal consonant has a simple consonantal oral quality, and, in addition, a vowel-like nasal quality (and only by this addition is, *e.g.*, *n* distinguished from *d*). The oral quality of the liquids, on the other hand, consists of a coupling of the consonantal and vocalic features, as a result of which the opposition of a liquid and another consonant is much more complex. This explains the fact that the liquids remain unknown to many languages, *e.g.*, to some American Indian languages, and appear in child language considerably later than the universal nasal consonants.

The opposition of the two co-ordinates which characterize the remaining consonants (including the nasals) as well as the vowels is not applicable to the liquids, although the articulation of four kinds of *r* — a dental, palatal, labial, and velar — is certainly included within the range of articulatory possibilities. The liquids split according to completely different distinguishing properties, the most important being the kind of conjunction of closure and opening. In the laterals and the intermittent liquids, both of the processes are connected in different ways with each other. In the lateral, closure and opening occur simultaneously, but in different places, while in the intermittent liquid, on the other hand, they alternate, but occur in one and the same place. The more complex a phonemic category is, the weaker is its capacity to split, the more rarely is it split in the languages of the world, the later does this split occur in child language, and the more easily is it given up by aphasics. This is the case, *e.g.*, with the distinction of *l* and *r*, and with the incomparably more exceptional distinction of *r* and *ř*. For the same reason, the number of affricates and their occurrence is very much restricted, as is also true of mellow fricatives and of rounded palatal vowels, and so on. Indeed, even among the universal nasal consonants, the back variety arise considerably later in children, are lost earlier in aphasics, and are much more frequently lacking in the languages of the world than the corresponding oral stops. The reason for this is that *ŋ* and *ɲ* have a more complicated structure, being opposed to the oral as nasal and opposed to the front as back consonants (cf. § 26).

E.g., the son of Blagoveščenskij (79f.) first acquires the basic triangle *u-a-i* (as a result *e* and *o* of the mother tongue become *a*), then *e* also emerges, while the Russian *o* is also replaced by *a* (*t'aj* "stol", *bas'* "voz", etc.), and only considerably later is *o* acquired as one of the last phonemes (cf. § 14).

[42] See A. Thomson in *Zeitschr. f. slav. Philo.*, XI, 348 and my article in *Proceed. of the Third Congr. of Phonet. Sciences*, 39.

IV

CONCLUDING OBSERVATIONS

31. PROSPECTS

The atomistic conception — the idea that most things which are highly characteristic of the first stages of child language (or of aphasia) are "outside of comparative and historical linguistics" — has been repeatedly expressed in the technical literature (see Thumb, 3). On the contrary, it is clear that the phonological acquisition of the child and the sound disturbances of the aphasic are based on the same laws of solidarity as the phonological inventory and the phonological history of all the languages of the world. Child language and aphasia can and must be incorporated into comparative (comparative in the widest sense of the word) linguistics.

If we compare, further, the sound changes of the child and the aphasic with the typology of the languages of the world, it becomes obvious that, in addition to the phonemic system, the inventory of phoneme combinations and the phonological, as well as the grammatical, components of language are subject to the same principle of stratification, and that this stratification of linguistic values, uniform everywhere and at all times, possesses its own immanent justification. Thus, there is a series of constant solidarities in the structure of every morphological or syntactical subsystem. A component of this system (*e.g.*, a part of speech, a case, a verbal category), which, with respect to some other component (another part of speech, case, or verbal category), proves to be necessarily secondary, arises in children after, disappears in aphasics before, and does not occur in the languages of the world without, the corresponding primary components.

32. GLOTTOGONY

On the other hand, the universal and panchronic validity, as well as the inner logic, of the observed hierarchical sequence of phonological oppositions permits us to assume the same sequence for glottogony. Many earlier assumptions about the origin of language are, in this way, refuted, while others, on the contrary, are confirmed: *e.g.*, Trombetti's view that stop sounds are more original than fricative sounds,[1] or van Ginneken's brilliant hypothesis, which attributes an original priority to the first consonantal oppositions in contrast to the vocalic oppositions.[2] Both the ontogeny and, probably, the phylogeny of language are based on the same underlying principle, which governs the whole realm of language.

33. PRINCIPLE OF LANGUAGE CHANGE

This principle is simple to the point of being trivial: one cannot erect the superstructure without having provided the foundation nor can one remove the foundation without having removed the superstructure. Nevertheless, the dynamic and static aspects of language obey this simple principle, which discloses the hierarchy of linguistic components and removes several problems, which Meringer, *e.g.*, considered still unsolvable (209). The linguistic progress of the child and the regression of the aphasic are, in

[1] *Elementi di glottologie* (Bologna, 1923), 608. This opinion is already mentioned by Sommerfelt in connection with his data on child language (*Langue et société, 51*), On the other hand, the Marr view, that affricates precede chronologically the emergence of stops and fricatives, proves to be absolutely arbitrary and false.

[2] *La reconstruction typologique des langues archaïques de l'humanité* (Amsterdam, 1939), 34ff. Cf. also the noteworthy glottogonic article of D. Bubrich — "Neskol'ko slov o potoke reči", *Bjulleten' LOIKFUN*, V (1930), 5, 11. Van Ginneken presupposes, to be sure, still an older stage, namely that of clicks, but he understands by this that these do not yet function in any way as phonemes, but as simple sound gestures: sound gestures generally and interjectional clicks in particular form a pre-linguistic (*op. cit.*, 27), external linguistic, and — as the study of aphasia shows — a post-linguistic stratum.

essence, direct and particularly concrete consequences of this principle. The stratified structure of language is in this way revealed. The more data linguistics makes available, from different peoples, on the speech of children and aphasics, the more significantly and thoroughly can it handle the structural laws of particular languages and of language in general.

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* The best bibliography of technical literature on child language is found in Brenstiern Pfanhauser (330-356) and in Stern, but both are incomplete, and the latter limits himself, with a few exceptions, to publications in the most common Western languages, whereas the former considers also Slavic works. Yosikazu Ohwaki supplies a list of Japanese contributions. The bibliography on language pathology by von Monakow (946-977), to some extent supplemented by publications by Thiele, Nadoleczny β, Ombredane β and Kleist γ, disregard the linguistic requirements, and publications of too few countries are noted in this list, although the pathologists themselves emphatically stress the acute necessity, to the study of aphasia, of bringing together more material from languages with different structures (e.g., Pick 69, 74, Isserlin 1085). In the midst of today's conditions, several contributions unfortunately remain inaccessible to me which could be of interest for the present study (*e.g.*, on child language — H. Cornioley, *Die sprachliche Entwicklung eines Kind von ihren Anfängen bis zum 3. Lebensjahr*, Bern, 1935; O. Decroly, *Comment l'enfant arrive à parler*, Brussels, 1932; K. Reumuth, *Die logische Beschaffenheit der kindlichen Anfänge*, Leipzig, 1919; on aphasia — A. W. G. Ewing, *Aphasia in children*, Oxford, 1931; T. H. Weisenberg and K. G. McBride, *Aphasia*, New York, 1935 and especially several wide-ranging Slavic works on the development and dissolution of language.

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